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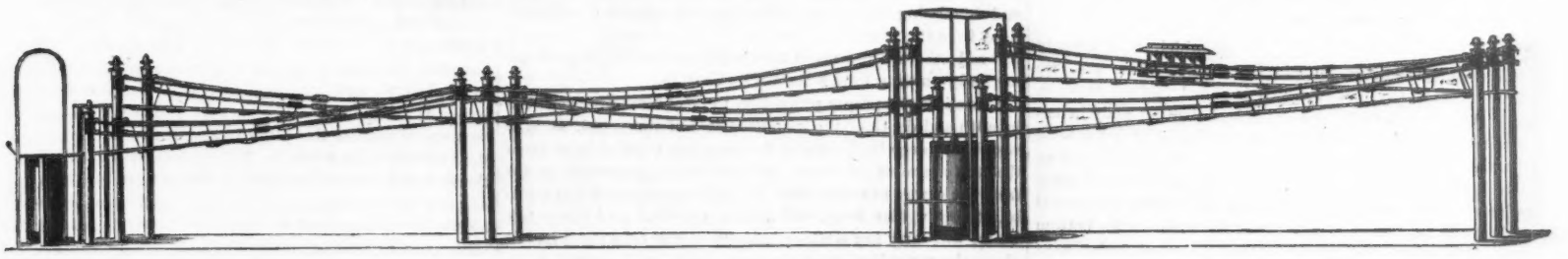
A New Elevated Railroad.

The necessity of frequent, speedy and reliable communication between the lower and upper parts of Manhattan island has called to life numerous schemes for the construction of railroads, the most prominent of which are the arcade, the depressed, the pneumatic and the elevated road, the latter to be worked by a number of stationary engines and cables.

To-day we present to our readers still another plan, which undoubtedly merits the attention of engineers and the public generally. We refer to Mr. ROBERT A. CHESEBOROUGH'S system of locomotion for elevated roads. This invention proposes an elevated railroad, the track of which consists of a series of inclined planes suspended by cables; the cars run down the inclines by their own gravity, and by elevating platforms at the foot of every incline they are raised to the head of the next incline. The elevating platforms are intended to be worked by compressed air, which is to lift a piston working in vertical cylinders; and to the piston-rod, the platforms, kept in place by guides, are to be attached directly. The compressed air is furnished by means of a stationary engine, air-pumps and receivers located at the end of the route. From the reservoirs a four-inch pipe is to run all along the road, and by the necessary smaller pipes and valves this is to connect with all the cylinders which it supplies with the motive power. Not more than fifty pounds pressure of air to the square inch are required, and even that will give nearly twenty thousand pounds of lifting force (more than twice as much as ordinarily required), if the cylinders are made with a diameter of twenty inches, so that the piston-head would contain nearly four hundred square inches.



A NEW ELEVATED RAILROAD.

The inventor intends to give the sections of his road such a grade at the outset or highest point as to secure for the cars a high momentum in starting, and then to reduce this grade gradually towards the lower end of the incline, so that the track would in reality not be a straight inclined plane, but cycloidal in form. For this purpose he proposes to grade the track according to the following table, if a section is made one mile long and the lowest point of every section twelve and a half feet above the street:

On the 1st	1000	feet a fall of	8	feet,	equal to a grade of	42½	feet per mile
" 2d	1000	" "	5	"	" "	26⅜	" "
" 3d	1000	" "	3½	"	" "	18⅜	" "
" 4th	1000	" "	2½	"	" "	13⅛	" "
" last	1280	" "	2	"	" "	8¼	" "
On one mile	5280	"	"	21	"		
Elevation of lowest point above street,				12½	"		
Elevation of highest point				33½	"		

If it should be found preferable to make the sections only one half mile long, the same grade might evidently be retained, while the total fall could be reduced to only one half of twenty-one feet, and a saving in first cost would also result from this plan. The grade would then be as follows:

On the 1st	500	feet a fall of	4	feet,	equal to a grade of	42½	feet per mile.
" 2d	500	" "	2½	"	" "	26⅜	" "
" 3d	500	" "	1⅜	"	" "	18⅜	" "
" 4th	500	" "	1⅛	"	" "	13⅛	" "
" last	640	" "	1	"	" "	8¼	" "
On ½ mile or	2640	"	"	10½	"		
Elevation of lowest point above street,				12½	"		
Elevation at highest point				23	"		

The route for this road should be selected along the line of the avenue, which offers the least differences in elevation, or along the two rivers on both sides of the island, where nearly a level could be obtained the whole length of the road. Passengers are to reach and leave the cars by means of a staircase, twelve and a half feet in perpendicular height, and from here they are to be elevated with the car to the top of the incline.

The detailed construction of the road is to be as follows: Iron columns, in sets of three, are placed from one hundred and fifty to two hundred feet apart, in line, in the middle of the roadway. These are connected lengthwise to each other at their tops by steel cables, from which two tracks depend, inclined in opposite directions to accommodate travel both ways; the middle line of columns supporting by its cables the inner sides of both tracks. Two cables along the sides of each track, and several feet above them, insure absolute safety. The track is supported every two or three feet by small cross-girders bolted to it, which, on each side, are connected with the cables overhead by short strong steel wires. No lateral girder or string-piece is used, the track resting directly on the cross-girders. The cables are made in sections of the length of the span between the columns, and are provided with screw buckles for taking up the slack and equalizing the strain between the various columns. The steel wires which connect the track with the cables are to be also provided with screw buckles, so that its inclination may be adjusted or altered if desired. The columns rest in sockets cut into a single iron plate or bed, placed crosswise to receive a set of three columns below the surface of the ground, and the plate rests on mason work. Just below the tracks each set of columns is braced by a crossbar bolted to the separate columns, and it may be again connected at the top by arches above the tracks. The cables along the sides form a continuous fender, which would prevent a car from falling in case of accident. The great advantage in this way of building, lies in the combination of great strength with simplicity and cheapness of construction. The strain on the columns is trivial compared with their sustaining power, and the strength of four one-half inch steel cables would bear more than ten times the weight to be sustained between columns, as no two cars would be running on a single span at the same time. The construction is all shop work, the putting together being perfectly simple and easy after the foundations are once made. The road is portable, and can be taken down and erected elsewhere without loss, excepting the foundations. A road for city travel, for cars holding thirty passengers each and running every minute, could be built in the most elaborate and complete manner for less than $50,000 per running mile, or $100,000 for a double track; thus making the cost of a road from Harlem bridge to City Hall less than $800,000, or less than the cost of building one-quarter of one mile of either the underground tunnel or Arcade road, while the capacity would be fully equal to that of the tunnel. Presuming the fare to be six cents and twenty millions of passengers being carried, (last year's returns of the Third Avenue road) the income over all expenses would be over one hundred per cent. on the cost of the road. Building the road in this manner, the elevation at which the track may be placed is not important, and an elevation of forty or even fifty feet could be had without any sacrifice of security. There are only one or two points on the Third avenue route for which a high elevation would be necessary to overcome the natural grade; and it might be found more advisable, rather than to use such an elevation, to tunnel through the crest of those hills, or use a short cable, continually running to carry the cars up and over the crests of these hills without stopping. A short cable, to carry a single car at a time, without stopping, up a short incline, is perfectly practicable. If the Third avenue was used as the route, the elevated tracks should be placed over the present surface tracks, and the incumbrance to the street would only consist in a set of three columns or at most of two sets on each block. The bases of the columns should be protected by stone facing. It would be hardly possible to devise a plan on which a reliable road could be built at so little sacrifice of space or with so little detriment to the street.

For country use to run light cars carrying, say six passengers, using wooden columns, light cables, and a very light track, and bringing the lower ends of the inclines nearly to the ground, thus dispensing with the elevation above the street, necessary in cities; a road could be built on this plan for $10,000 per running mile, or for a sum less than the usual cost of grading an ordinary railroad. Light freight has been transported in a manner similar to the one proposed by the inventor by using a single inclined wire supported from the arms of wooden columns some fifty feet apart, on which small box cars, being suspended from grooved wheels, are running. This plan has been used to great advantage, as the cars can run for two or three miles on a single decline, carrying freight at very small cost. The cost of such a road does not exceed $500 per mile in a country where wood is cheap, as is often the case at mines. Horse power may here be used to elevate the boxes to the tops of the inclines, if several are necessary.

The Removal of Blossom Rock in San Francisco Harbor.

BY a telegram from San Francisco, dated April 23d, we have an account of the successful removal of Blossom Rock, the most dangerous obstruction in that harbor. The submarine mine was exploded at 2 o'clock, P. M., on that day. Twenty-three tons of powder were used. When this immense amount of powder was touched off, the water, apparently one hundred feet in diameter, was thrown to the height of about one hundred feet, the centre being filled with smoke and stones, the latter going far above the water. Between fifty and sixty thousand people witnessed the explosion. The explosion was scarcely perceptible in the city; only a deep thud accompanied the blast.

Blossom rock has proved a great annoyance and danger to shipping. It was submerged six feet below the surface at low tide, and was situated where the water rolled in large swells, which, being interrupted in their progress, were broken an tossed into wild commotion. The difficulties to be encountered in an attempt at removing a huge mass of rock so situated can readily be imagined; yet this work was begun, and with the utmost confidence in its ultimate success, nearly four months ago, by Colonel VON SCHMIDT, civil engineer. The means adopted for its removal were entirely novel in submarine blasting, and he undertook the experiment at his own risk.

The first work to be done was to make a careful survey of the rock, ascertain where it dipped in, and where it projected, so that in the work of excavation afterwards to be accomplished, a sufficient space might remain to resist the pressure of the water. This was carefully done, and from it plans were drawn of the rock. The next work was to construct a water-tight coffer-dam on the rock, and around that part of it through which the shaft was to be sunk. This was found to be most difficult. The coffer-dam was first put in its place, and then a scow was built around it, into which about two hundred and fifty tons of stone were thrown. The dam was lined around with bags of sand, to more effectually keep out the water, and when this was complete, an iron turret was placed inside of it. This turret was embedded or sunk in the rock a distance of three feet, and closely and thoroughly cemented in its place. This being done, the work of excavation, or sinking the shaft, commenced. A platform was erected on the rock, fifty-six feet in length and about twenty in width. On this an engine and a complete hoisting apparatus was placed at one end, and at the other a shanty was erected, containing six sleeping apartments and a kitchen, which was also used as an eating room by the workmen. When the shaft had been sunk sufficiently to permit the work of excavation to be extended to either side, the work was considered fairly begun, and from that time forward it was pushed with all the despatch possible. When the shaft had reached a certain depth, a small cylinder was placed inside the original turret, extending down into the shaft, which made the hoisting of the ballast from below more convenient. The plan for the removal of the rock can best be understood in this way. The object was to scoop out the centre, producing a cavity inside, measuring in the clear, from the highest point to the bottom, twenty-five feet, and leaving a crust or stratum of about six feet thick to resist the pressure of the water while the work was in progress—this crust or stratum to be blown up by powder when the remainder of the work inside had been completed. To do this, however, was not only difficult but perilous, and involved the heaviest responsibility. It required the closest attention, and the exercise of more than ordinary skill. As the work progressed and the excavation became larger, the crust of rock left standing would naturally become weaker and more likely to cave in. In order to prevent this, pillars of rock were left standing at short intervals from each other, until the limit of six feet was everywhere reached. Then it became necessary to move those pillars away. Before this was done, uprights of heavy timbers were set thickly around the cavity to supply their place, and in this way all fear of the roofing falling was obviated. All the pillars, except the two

main ones, were removed several days ago. The cutting away of these two was the last work done before the powder was stored for the grand explosion.

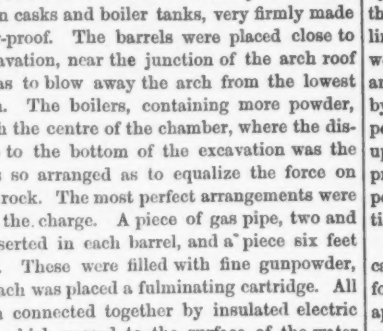
The amount of powder used was about twenty-three tons, which was placed in casks and boiler tanks, very firmly made and perfectly water-proof. The barrels were placed close to the side of the excavation, near the junction of the arch roof with the floor, so as to blow away the arch from the lowest point of excavation. The boilers, containing more powder, were placed through the centre of the chamber, where the distance from the top to the bottom of the excavation was the greatest. This was so arranged as to equalize the force on each portion of the rock. The most perfect arrangements were made for exploding the charge. A piece of gas pipe, two and a half feet, was inserted in each barrel, and a piece six feet long in each boiler. These were filled with fine gunpowder, and in the end of each was placed a fulminating cartridge. All of these were then connected together by insulated electric wires, the ends of which passed to the surface of the water through a tube in the shaft, and thence to a vessel at anchor about one thousand feet from the rock, in a southerly direction. Here it was connected with an electric battery, in charge of Mr. J. S. FIELD, an electrician of approved skill. The fulminating cartridges, when reached by the electric spark, were expected to explode, setting fire to the powder in the tubes, and thence communicating to the mass of powder in the casks and boilers. When all was arranged the coffer-dam was removed, and the water permitted to fill up the excavation and act as tamping. The space excavated measured in the clear, inside, one hundred and forty by one hundred and fifty feet, and it is estimated that about forty thousand cubic feet of stone were removed in making it. The height of the highest pillar was twenty-nine and that of the lowest four feet.

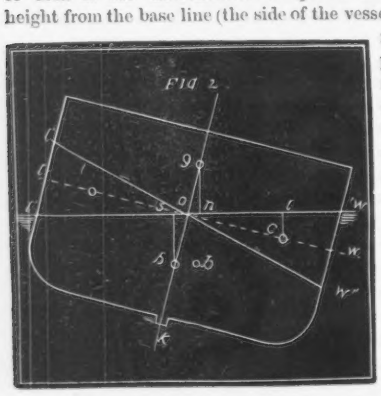
We have only to add that Colonel VON SCHMIDT and the government engineers of San Francisco say that the surveys indicate that Blossom Rock has been utterly demolished by the blast, and thrown in all directions. The soundings give thirty-eight feet of water over its site at low tide.

Stability of Vessels.

THE stability of a vessel is that property which enables her to maintain an upright position in the water. There are two different kinds, the first of which is called *Statical Stability.* This is the amount of force exerted by a floating body in endeavoring to regain the vertical position from which it has been inclined. The second kind or form of stability is known as *Dynamical Stability,* and is the measure or moment of the weights required to deflect or incline a floating body from its vertical position in the water. The pressure of the water on the bottom of a vessel being upward, the tendency of that pressure is always to upset and overturn her, and the moment the vertical centre of the hull is inclined to one side, the tendency of the weight of the hull is also to overturn the vessel, in which it is assisted by the upward pressure of the water acting upon the opposite side. It is evident, then, that the vessel in heeling over must create by its movement the statical stability which is to cause it to return to its vertical position. We will endeavor to show, by means of the following figures, whence this force is derived, and in what manner it accomplishes its purpose.

FIG. 1 represents the midship section of a vessel floating on an even keel, having the water-line at *w, l,* with the centre of buoyancy at *b,* and the centre of gravity at *g.* Let us now suppose this vessel to be careened over to an angle of fifteen degrees, as shown in FIG. 2, and note how the position of these points has changed. The prism, *w', o, w,* has been immersed, while the prism *l', o, l,* has emerged from the water. The centre of area of the first-mentioned prism is at one-third its height from the base line (the side of the vessel) at *c.* The immersion of the prism has, therefore, not only added that much more total submerged area to that side, and subtracted it from the other, but having its centre of gravity so far out, it has brought the centre of the whole immersed area very much over towards the submerged side, to *b.* As, however, the unsectioned portion of the submerged body (FIG. 1) is always the upsetting force to whichever side the vessel is inclined, and from the immersed prism is always obtained that which has been defined as the statical stability; it is necessary, in calculating the stability, to take into consideration separately the effect of these two forces. To do this, we find the centre of area of the portion always under water, which is at *b;* from this we erect to the water-line the perpendicular *b s,* (FIG. 2), which represents the upsetting power of this body. Next we erect from the centre of area of the immersed prism he perpendicular *c, t;* this represents the force which tends to restore the vessel to its vertical bearing. To calculate their relative effect, multiply the area of *w", k, o, l,* by the distance on the water-line of *b* from *o,* the centre of *w, l,* and the area *w', o, w",* by the distance *o, t,* and as the product of the latter is greater than that of the former, so will be the height above the water-line at which the vessel will have stability to carry a given weight—that is to say, *g,* the centre of gravity of weight of hull and cargo, can be carried up on *g, k,* until its weight, multiplied by the distance from *w,* (the point where a perpendicular dropped will strike the water-line), to *o,* added to the product of the upsetting force, will be a little less than the product of the prism. If it were the same, the vessel would remain in that position, and it will return in greater force and speed proportionate to the unbalanced amount of the latter product.





The height to which the centre of gravity of the hull and cargo may be raised, is dependent therefore upon the statical force derived from these immersed prisms, or, as SCOTT RUSSELL aptly terms them, "the shoulders of the vessel." This height, as shown, is susceptible of calculation, and is called the "meta-centre." It is generally found by the following formula: Divide the length of the vessel on the half-breadth plan at the water-line into equal parts, and from these points erect ordinates, cube these ordinates, and to the sum of the first and last of these cubes add four times the sum of the cubes of all the even and twice the sum of the cubes of all the odd ordinates. Add these up, and divide the result thus obtained by the displacement of the vessel, and two-thirds of the quotient gives the distance of the meta-centre above the centre of gravity of displacement.—MURRAY.

As has been shown, if the centre of gravity comes above the meta-centre, the vessel will be unstable—if it coincides, it will be neither stable nor unstable; but if below, the vessel will have stability. Care must, however, be taken to give only the proper degree of stability, as a vessel having too much will roll too quickly, and not in harmony with weights high above her decks, such as the masts; and many vessels from this defect have broken their masts by their rolling.

Dynamical stability is found by assuming a weight to be placed a short distance to one side of the centre of the vessel, and calculating the amount of heeling so produced; by deductions from this result are also found the times in which a vessel will roll—that is, how much time will be occupied in performing and returning from a certain inclination.

There is also a proper proportion to be observed between the breadth and depth of the immersed area of the vessel, as in a vessel very deep in the water the upsetting portion is so large that the centre of gravity of the immersed prism must be far from the centre to balance it. SCOTT RUSSELL states that a vessel of rectangular form, with twelve feet draft and thirty feet beam, will carry her centre of gravity of hull only three inches above the water-line, while the same width, with six feet draft, will carry her centre of gravity nine feet six inches above the water-line, and with six feet draft and forty-two feet beam the centre of gravity may be twenty-one feet six inches above the water. This great beam to light draft is the reason of our being able to carry such enormous structures on our American river boats, where cargo, machinery and passengers are all carried high above the water, and is another evidence in favor of the light-draught and great-beam principle in the designing of steamships, set forth in former articles.

Where the exact character and disposition of the cargo is known, as in men-of-war, colliers, etc., the naval architect can so fashion his immersed body as to provide ease of motion with safety. But when the cargo is of a miscellaneous and variable character, much depends upon its proper stowing, as by the different placing of the various articles of the cargo, the point *g* may be raised and lowered, and while a well-stowed ship will be easy in her movements, a badly-stowed one will be uncomfortable, and perhaps unsafe. T.

The Staten Island Bridge.

THE proposition for shortening the transit between New York and Staten Island, has for its basis the proposed bridge for connecting New York city with the latter place, the bill for which has just passed the State Legislature. The project has been considered and matured after a thorough examination of the coast charts of the United States survey of the harbor of New York, having particular reference to the depth of water, the nature of the bottom and the natural barriers for the protection of the structure. It is proposed to build, at the distance of three-fourths of a mile off the Battery, an extensive bulkhead, and from this bulkhead a bridge 23,200 feet long to the Staten Island shore. The bridge beginning, as stated, at a bulkhead, is to be built on the shoals or shallows easterly of Ellis Island, with several slips for ferry communication with the various lines leaving the south-westerly extremity of the city and such points on the east and north sides as may be required, and run thence along the shoals or shallows a generally southerly course near and past Robbins' Island up to the island itself. Most of the route is not covered with more than five feet of water at mean low tide, the ground frequently appearing at low water. In pile driving but little trouble, therefore, is apprehended, and it is calculated that the whole work—the ordinary dock builders of the city being able to easily construct four-fifths of the length, which will not exceed four miles—can be completed by letting out sections to different contractors within nine months' time.

The bridge is to be built of iron and sufficiently high to admit the passage of the largest class of steamers and sailing vessels underneath. It is to be 120 feet in width, with four railroad tracks, a carriage way and one for pedestrians. Some large railroad interests are already looking to the use of this bridge in connection with the Pacific railroad route as the most feasible terminus at the end of the route. The Communipaw channel, coming in above the proposed bulkhead, contains seven and a half feet at low water and nearly twelve feet at high water, thus affording a passage for most of the water craft which ply between the city and the Jersey Kills. Properly dredged it would afford a passage for the boats of the Camden and Amboy Company and any other large steamers.

Then it is proposed to construct a railroad direct from Perth Amboy to the bulkhead, and by means of ferry-boats like those across the Susquehanna, on the Baltimore and Ohio road, to bring the cars to the Battery. The route for the proposed road through Staten Island has already been surveyed. Foot passengers and carriages will likewise be conveyed from the bulkhead to the Battery by boats. It is believed that the Camden and Amboy road will at once adopt this route for reaching the city, inasmuch as it will land both passengers and freight in New York and effect a saving of thirty-five minutes in time between New York and Philadelphia; and, instead of requiring thirty-five minutes in passing to and fro between New York and Staten Island, reduce the time to twelve minutes' transit.

Should this scheme succeed—and we see no reason why it should not—thousands of our population who are now migrating up the Hudson, into Weschester county and Long Island, will be drawn down the bay, and it is not improbable that the Battery and surrounding streets will witness a return of their whilom life and activity. It will bring into communication with New York a hitherto comparatively remote district of New Jersey and furnish Staten Islanders with what they have for years been demanding—a more expeditious means of reaching the city. The estimated cost of the bridge is $1,500,000—N. Y *Herald.*

Bessemer Steel in Sweden, Austria, Prussia and France.

From the Report of Mr. SLADE to A. HEWITT, United States Commissioner to the Paris Exposition.

SWEDEN.

AN examination of the specimens of Bessemer steel from Sweden, in the Exposition shows us that the metal there produced is of a far superior character to that made in England, and naturally leads to inquiry as to the cause of the difference, and whether we may hope to attain the same success in the United States. First, we observe coils of wire of all sizes, down to the very finest, such as No. 47, or even smaller. This they have not been able regularly to produce in England. In the next place we notice a good display of fine cutlery, and the writer is informed by a competent authority that this metal answers so well for this purpose that it is now used almost to the exclusion of any other. This statement is corroborated by the fact that in the miscellaneous classes of the Swedish department, where cutlery occurs not as an exhibition of steel, but merely as a display of workmanship by other parties, in the same manner as other articles of merchandise, cases of razors are exhibited with the mark of the kind of steel of which they are made stamped or etched upon them as usual, and these are all "Bessemer," but from a variety of different works, namely, Högbo, Carlsdal, Osterby & Söderfors. The ore used in Sweden for producing iron for the Bessemer process is exclusively magnetic, and of a very pure quality. An analysis of a mixture of those used for the iron employed at the Fagersta works before roasting gives the following composition:

Carbonic acid	8.00	Magnetic oxide	32.15
Silicium	17.35	Peroxide of iron	27.40
Alumina	0.95		
Lime	6.50		100.05
Magnesia	4.35	Phosphoric acid	30
Protoxide of manganese	3.35		

All the pig made from this mixture of ores, the exhibitors state, will give a steel without the use of spiegeleisen, which is not at all red short.

The analysis of grey iron from the same works, used for the Bessemer process, is given as follows:

Carbon combined	1.012	Manganese	1.919
Graphite	3.527	Phosphorus	0.031
Silicium	0.854	Sulphur	0.0.6

The cinder, produced at the same time as the grey iron, shows on analysis a composition of

Silica	53.30	Protoxide of manganese	7.85
Alumina	3.00	Protoxide of iron	0.99
Lime	21.10		
Magnesia	13.95		100.10

The analysis of mottled pig, *(la fonte truité)* consisting of two-thirds grey and one-third white, is

Carbon combined	2.138	Manganese	2.926
Graphite	2.733	Phosphorus	0.026
Silicium	0.641	Sulphur	0.015

Of each of these it is stated that the steel produced without the employment of spiegeleisen is not at all red short, *(cassant à chaud.)* The most noticeable feature in the composition of these irons is the large percentage of manganese which they contain, together with the extremely minute proportion of sulphur. The latter quality is due to the exclusive employment of charcoal in the blast furnaces, together with the adoption of a very high temperature in the roasting kiln. These latter are constructed on Westman's patent, and are made very high and heated by the waste gas drawn from the blast furnaces. The heat is carried as high as is possible without agglomerating the materials, and by this treatment the ore is changed from a hard and compact substance to a very porous one, while at the same time it is stated that any percentage of sulphur less than four per cent. is driven off. The blast furnaces are very small, being generally but eight feet in diameter at the boshes and about three feet at the hearth, with a height of forty feet. With these ores prepared in this manner, such a furnace will yield from seventy to eighty tons per week. It is thought by the best informed engineers in Sweden that these furnaces should be made larger, and in future they probably will be so; but these dimensions represent the furnaces that now exist, and with which the iron in use has been produced.

In the process of conversion, from motives of economy, a fixed form of vessel is employed, instead of one mounted on trunnions, as in England and elsewhere. The tuyeres, about nineteen in number, are placed horizontally just above the

bottom of the vessel, and are inclined a little from a radial direction, so as to give a rotary motion to the mass of molten metal. An air passage surrounds the vessel at the back of the tuyeres, with a movable plate opposite each, to allow access to them. The upper portion of the vessel, from the line of the top of the blast passage, is made removable for lining, etc.; the bottom of the vessel is slightly inclined towards the tap-hole, so that the whole of the metal and slag may run off. The metal is run in at a spout in the upper portion of the vessel, and from the fixed position of the vessel it is of course necessary to have the blast on all the time that the metal is being run in and drawn off, to prevent its flowing into the tuyeres. This fact must make it more difficult to regulate the exact amount of decarbonization of the metal, and tend to render the last portion drawn off overdone. The removal of the cinder remaining in the vessel after a blow is not so easily accomplished in the fixed vessels as in the revolving one, as ordinarily used.

Accompanying the analysis of ores and irons, given above, the Fagersta works exhibit an analysis of the slag from the converter, taken at the close of the process, and it shows the composition to be as follows:

Silica	44.30	Protoxide of manganese	24.55
Alumina	10.85	Protoxide of iron	19.45
Lime	0.65		
Magnesia	0.45		100.25

The case of specimens exhibited by these works is the most interesting by far in the Exposition. It contains a most extensive collection of pieces of various forms, with which a very elaborate set of experiments has just been made at Mr. D. KIRKALDY's testing works, at London. The samples are classified according to the percentage of carbon which they contain, and have been tested to show their action under strains of tension, compression, torsion, bending, and, in the case of plates, bulging.

The amount of carbon contained in the steel varies from 0.1 to 1.50 per cent., though most of the experiments were made between the limits of 0.3 and 1.20 per cent. In addition to the large collection of test pieces, they exhibit some railway carriage axles containing 0.3 per cent. of carbon, one being bent double, with a radius of curvature at the bend of about five inches; a locomotive axle containing 0.4 per cent., and a tire having 0.5 per cent. of carbon. There is, also, as already mentioned, a fine display of cutlery, razors, some beautiful hand mirrors containing 1.0 per cent., a small drill containing 1.50 per cent., with a plate beside it containing 1.00 per cent., through which it had drilled several holes; a number of long turnings taken off in a lathe, showing remarkably the absolute continuity of the grain—one of 0.3 per cent. of carbon measures thirty-six feet in length, and is closely coiled with a diameter of about one-twelfth inch; another of 0.9 per cent. is twenty-seven feet long and slightly less in diameter. There are also a large number of files, and, as previously mentioned, coils of wire of all sizes, and apparently any required length. A very interesting table of results was obtained from a series of eleven small square bars containing varying percentages of carbon, as follows:

STRENGTH OF STEEL CONTAINING DIFFERENT AMOUNTS OF CARBON.

Number.	Per cent. of carbon.	Sectional area before elongation, square inches.	Breaking weight, in pounds.	Breaking weight per square inch.	Section after fracture at point of rupture.	Proportion of ruptured section to original section.	Breaking weight per square inch of ruptured section.	Per cent. of elongation.
1	0.35	.2323	16,262	69,730	.0854	36.65	190,250	12.0
2	0.45	.1448	14,603	100,800	.0996	68.5	147,169	10.3
3	0.45	.1398	14,663	104,300	.1150	81.9	134,300	9.2
4	0.70	.234	29,540	125,800	.2026	86.3	145,750	1.56
5	0.70	.1568	16,074	102,300	.1314	83.46	122,300	4.0
6	0.70	.1515	19,841	131,400	.1400	92.05	141,660	5.4
7	0.70	.1485	17,006	114,100	.1230	82.55	138,240	5.8
8	0.90	.1466	19,935	135,400	.1189	80.80	167,500	6.7
9	1.00	.2338	30,012	128,400	.2242	95.69	133,800	2.3
10	1.00	.1516	20,218	132,700	.1400	91.93	144,300	6.6
11	1.00	.1494	21,726	144,800	.1400	93.31	155,120	4.0

The cost of steel for the more delicate uses, such as razors, etc., is very much less by the Bessemer process than by the old method of re-melting in the crucible. The materials in ordinary use are sufficiently pure to give such a steel, and the only special precaution which has to be observed in producing these qualities is to add a sufficient amount of re-carbonizing pig to give the required per cent. of carbon, and then in the process of tilting the bars to carefully reject any piece which may show sign of flaw, as would of course be necessary under any circumstances. The total production of Bessemer steel in Sweden in 1864 was 3,178 tons; that of crucible steel exceeded 4,500 tons.

AUSTRIA.

The conditions under which Bessemer metal is produced in Austria are in many respects similar to those existing in Sweden. The iron employed is smelted with charcoal, is nearly free from sulphur and phosphorus, and contains a large percentage of manganese. There are differences in the manner of conducting the process, but these important conditions insure the production of a metal of similar excellence to the Swedish, and, like this, much superior to the ordinary metal produced in England.

The principal works in Austria are at Neuberg, in the province of Styria, and are carried on by the government. The iron is obtained from spathic ores smelted in two furnaces forty-three feet high, and yielding from 100 to 150 tons per week. The iron produced is found by analysis to contain 3.46 per cent. of manganese, and, as in Sweden, it is used for re-carbonizing, in the place of the usual spiegeleisen. Originally a fixed vessel was erected at these works, similar to those used in Sweden, but this has been superseded by a pair of three-ton vessels of the ordinary construction. Fixed or Swedish vessels are, however, still in use at other Austrian works. The metal is run directly from the blast furnaces into the converters. Very interesting tables are exhibited by these works, giving analyses of the iron and slag at five periods in its conversion from its condition as tapped from the furnace to its final state as Bessemer metal. These are extremely interesting from the light which they throw upon the relative rapidity with which the components of the pig iron are attacked by the blast, and the permanency of some ingredients, such as phosphorus and copper, during the entire process. The results are as follows:

ANALYSES OF IRON AND SLAG DURING CONVERSION TO STEEL.

	As tapped from blast furnace.	After the disappearance of the sparks from the converter	After the boiling over period.	End of blowing.	After addition of pig for recarbonization
IRON.					
Graphite	3.180	.....	.....	.....	.....
Carbon combined	0.750	2.465	0.949	0.087	0.234
Silicium	1.969	0.443	0.112	0.028	0.033
Phosphorus	0.040	0.040	0.045	0.045	0.044
Sulphur	0.018	Trace	Trace	Trace	Trace
Manganese	3.460	1.645	0.429	0.113	0.139
Copper	0.085	0.091	0.095	0 120	0.105
Iron	90.507	95.316	98.370	99,607	99.445
SLAG.					
Silica	40.95	46.78	51.75	46.75	47.25
Alumina	8.70	4.65	2.98	2.80	3.45
Protoxide of iron	0.60	6.78	5.50	16.86	15.43
Protoxide of manganese	2.18	37.00	37.90	32.23	31.89
Lime	30.35	2.98	1.76	1.19	1.23
Magnesia	16.32	1.53	0.45	0.52	0.61
Potash	0.18	Trace	Trace	Trace	Trace
Soda	0.14	Trace	Trace	Trace	Trace
Sulphur	0.34	Trace	Trace	Trace	Trace
Phosphorus	0.01	0.03	0.02	0.01	0.01

For each charge blown at these works a small test ingot is cast, and this is immediately reheated and subjected to a number of tests to ascertain the quality of the steel; and, according to the results of these trials, all the metal produced is divided into seven grades of varying hardness, No. 1 being a blue steel, containing from 1.12 to 1.58 per cent of carbon; and No. 7 a soft iron, with from 0.5 to 0.15 per cent.

The test employed consists in hammering the little ingot into a bar, and subjecting it to severe working on the anvil, in a way which would tend to crack it if of a red, soft nature, or of inferior quality. It is then heated and plunged into water, and the amount of hardening produced proved by striking it with a hammer, and observing the amount of flexure produced. It is then heated again, and bent over upon itself and welded into an eye, the welded portion being drawn out to a small section and broken off. These tests take but a short time, and the expense of making them is insignificant in comparison with the accurate knowledge thereby obtained of the nature of the steel and the purposes for which it is suitable. As a rule, the steel produced at the Neuberg works welds with great facility, and, in fact, all the tires produced here are welded as in the case of iron. A table of the tensile strengths and other properties of steel, of the various classes below No. 3, is exhibited, and is as follows:

TENSILE STRENGTH AND OTHER PROPERTIES OF STEEL.

	No. 4.	No. 5.	No. 6.	No. 7.
Percentage of combined carbon	0.62 to 0,88	0.38 to 0.62	0.15 to 0.38	0.05 to 0.15
Tensile strength per square inch	51.65 to 63.13	40.17 to 51.65	34.43 to 40.17	28.69 to 34.43
Extensibility	0.10 to 0.05	0.20 to 0.10	0.25 to 0.30	0.30 to 0.25
Hardening	Very well.	Very well.	Feebly	Not at all.
Welding	Very well.	Very well.	Very well.	Very well.

The softest grade is used for wire, sheet steel, etc., and the higher numbers for boiler plate, gun barrels, axles, tires, tools, and cutlery, according to the hardness required.

A printed list gives the price of the steel in various forms delivered at the works, which, reduced to gold dollars, is as follows: ingots, $77 50; bars, $138; boiler plate, $145 50. These prices are little above those charged in England, where coal is abundant and an inferior quality of metal produced.

PRUSSIA.

In other countries than Sweden and Austria, we find nothing that presents any remarkable feature not to be found in English practice. Of course, Krupp is far ahead of all others in respect to the size of the masses that he casts. He exhibits in the Exposition a 40-ton (40,000 kilograms) ingot, intended for a crank shaft, which he states was cast from crucibles. His process of making tires is similar to that in use in England. He first makes a bloom about six feet long and thirteen inches by ten inches, and then cuts this up into sections of the required weight. A slit is cut through the middle of these, and they are then worked out into an annular form, and afterwards rolled on a mill of a construction similar to those in use in England, with the exception that the bed, instead of being horizontal, is vertical, as if one of those machines were turned up on its edge. Two mills, one for roughing and one for finishing, are employed. His tire-heating furnaces are placed in a pit at the side of the mill, and are similar to the furnaces of a brass foundry, the tires being laid on the fire by a central crane.

FRANCE.

The French also exhibit good specimens of Bessemer metal, but, as already stated, there seems to be no marked advance on what has been accomplished in England, and it will not be necessary, therefore, to notice in detail the articles they have brought forward.

The manufacture has been established at six works, and the production, in 1866, was as follows:

	TONS.		
Compagnie de Terrenoire	1,537	S. Menans & Cie	000
Cie de Chatillon, Commentry	59	De Dietrich & Cie	486
Societe d'Imphy, St. Seurin, (Jackson's)	4,858	Petin, Gaudet & Cie	3,851
		Total	10,791

Of this product, 3,687 tons were in the form of rails. In 1863 but three works were in operation, with a total product of 1,857 tons. At the present time the metal produced in France by this process does not stand so high in the opinion of iron-masters as puddled or other steel. It may be that this is due to the nature of the pig-iron employed, or it may be due to a lack of experience in the manufacture as compared with other nations. At the works of Messrs. PETIN, GEUDET & Co., near St. Etienne, a pair of six-ton converters have been erected, and a single vessel, capable at present of producing a charge of eight tons, and in which it is expected to make twelve-ton charges when the lining becomes reduced in thickness. This is the largest Bessemer apparatus in France.

Santo Domingo.

LETTER FROM PROF. GABB.

III.

TO THE EDITOR—SIR: The copper mines of the Republic, with a single exception, all lie in the province of Santo Domingo, and require but a meagre notice. An exception is an old locality in the province of Vega, near Cotuï. This is a hill of magnesian slates with an abundance of copper stains, and the usual supply of carbonates. Considerable work has been done in digging trenches in all directions, and in sinking one or two shafts, now all in ruins, searching for veins that were never found. The place is now completely deserted and is likely to remain so. A good mine of copper would be comparatively valueless, situated as this is, on a high ridge, in the heart of a mountain mass, a hundred miles from the coast and without a road.

In the province of Santo Domingo, there are two districts, or groups of localities where the metal has been found. The first of these lies on the Nigua river and extends from there, a little south of east to the Jaina at the little settlement of Cobre. At many places within these limits are spots where carbonates, oxides, and silicates of copper are found in more or less distinctly marked vein-like masses, sometimes merely scattered through the county rock in patches; at other times associated with quartz and forming pretty regular veins.

The best of these, in fact the only one that shows any definite promise of future value, is the Monte Mateo mine, once worked by the "St. Domingo Copper Company of New York." This is on the west bank of the Nigua river, nine or ten miles above San Cristobal and crops out on the foot of a high bluff overhanging the water. The country rock is a bluish and greenish metamorphic clay slate of secondary age, either cretaceous or jurassic. The outcrop consists of a discoloration of this slate by oxide of iron over a width of over a hundred feet. Scattered everywhere through this, are little nests and streaks of iron pyrites. Excavations were made in the most promising parts of this exposure, which resulted in finding first narrow seams of low grade pyrites, which eventually converged and yielded a fair quantity of ore, which contained, as I learned from the assay certificates of respectable chemists of New York city, from twelve to twenty per cent. of copper, besides several dollars of gold to the ton.

The deepest works reached are about 50 feet from the surface, and the vein was said, at that point, to be pretty well marked; but failure of funds, or some similar cause, produced a cessation of the work, which has never been resumed. The mine is now in ruins, and the locality apparently abandoned. With a good market price for copper, twenty miles of good road from the mine to Santo Domingo, and the absence of custom-house dues, this mine might become a valuable property. There is certainly a pretty fair show from the outside, and the accounts of those who knew the underground works are such as to make it very probable that a more or less regular deposit of copper, in considerable quantities, exists here.

Following the direction of the outcrops about one and a-half miles distant, on the Arroyo Maimon, is another "mine," where a shaft was sunk, and a mixture of poor copper pyrites and magnetic oxide of iron was obtained. Several other outcrops exist on the Nigua, similar in appearance, but much smaller than that at Monte Mateo. Crossing the Nigua, on the ridges forming the watershed between that river and the Jaina, are some other deserted mines, once worked by an Englishman named HENEKEN. These contain quantities of purple sulphurets, usually in nests with much quartz. The amount of copper is not sufficient to render them of value. I found at the rate of between $1 and $2 of gold to the ton of quartz, in one of them.

Going still further east, on the west bank of the Jaina, is a small group of hills, in which is a settlement called Cobre. Here copper stains and streaks are found everywhere in the rocks, more especially in a peculiar black hornblende slate. No vein structure, nor anything resembling it, has ever been found, though hundreds of small excavations have been made.

The second of the two districts mentioned above deserves but a word. It lies on both sides of the Bani river, a few miles above Bani, at the foot of Mount Barbacoa. A few outcrops have been observed on the bluff of the river, and little excavations made here and there, without results. The exposures resemble those of the Nigua in general appearance, and the country rock is not unlike that of the other locality, but as yet nothing whatever can be predicted upon the mines.

It will be seen from what I have said that there is but little future for the copper mining interests of the Island. But one mine has ever been opened that shows any promise of becoming valuable, and that is back in the mountains, where expensive roads will be an absolutely necessary antecedent to success.

After gold and copper, the next metal to be considered in the mineral resources of the Island, is iron. In fact, in its real economic importance, it may be an open question whether it should not hold the first rank. In the province of Santo Domingo itself it occurs in a few localities, but either so far from the coast, so small in quantity, or so poor in quality, as to render their deposits of little or no practical value. At Arbol Gordo, and elsewhere in the Upper Jaina, masses of bog are scattered through the soil, and much of the building stone of the ruined and almost forgotten city of San Buenaventura is

of this material. Again, on many of the savanas north of Santo Domingo city, are other deposits of a very poor, sandy, bog ore, not rich enough to pay for working. In Monte Prieta is a better one, but more than twenty miles from the nearest point of shipment.

But in the province of Vega are outcrops of magnetic oxide, magnificent in appearance, unsurpassed in quality, almost unlimited in quantity, and on streams that can be rendered navigable. In one place I examined a hill several hundred yards long, three or four hundred yards wide, and sixty to eighty feet high, one half of which was a solid mass of ore, equal to the best I have ever seen; the other half of the hill is a semi-crystalline limestone. This is in the heart of a country where hard wood forests cover the greater part of the surface, where charcoal can be made for a mere song, and where, with a reasonable preliminary expense, barges can carry the pig iron to the sea.

Other deposits of iron, equally good in quality, but not so well located, exist in the same region, on a tract of several miles in extent, to the south-west of Cotue; and were it possible to introduce the iron into the United States, duty free, they would be a good field for the investment of capital.

In a future letter I shall endeavor to give you a fuller and, I trust, a better description of these iron mines. As yet, I have seen but two or three of them, and these only cursorily. The work of the survey now lies in Vega, and we will soon have an opportunity of studying them all in detail.

Besides the metals so far enumerated, others of course are reported to exist. Silver mines, tin mines, quicksilver mines, and even mines of platinum are talked of as glibly as in Nevada; but I have never seen them, and now do not expect to. But mines of salt and wells of oil do exist in the province of Azua. The salt mountain of Neybo has been described to me by persons in whom I have confidence, as being an immense mass of rock salt; and I have seen masses of salt from there of half a cubic foot, as clear as glass or Iceland spar. In the western part of the province of Santa Domingo, near Bani, and elsewhere, are numerous and large brine springs, that could be utilized with profit.

Polytechnic Club of the American Institute.

Meeting held at the Rooms of the Association, April 28, 1870, Professor S. D. TILLMAN in the Chair.

DR. VAN DER WEYDE spoke upon the latest discoveries in regard to malaria, and the means used for investigation, especially the devices for the examination of opaque liquids. The arrangement was then shown as applied to the doctor's own microscope. First, the liquid was placed in a cell, not as is ordinarily used in microscopic investigations, but set in a perpendicular position, so that the light may be passed through it in a horizontal direction; the light from the cell is refracted and reflected by means of a prism up the tube of the microscope, and then, by another refraction and reflection, direct through the eye-piece in a horizontal line to the eye. This is very convenient, and saves many annoyances of former methods. Formerly, doctors had little faith in the revelations of the microscope, and scouted the idea that some diseases were originated by animalculæ—as the itch and some others. The researches of the greatest of microscopists, Dr. HALLIER, of Jena, were then alluded to, and his conclusions in regard to the germs formed in the bile of cattle dying of the Texan cattle disease stated at some length. This Texan cattle distemper answers to the yellow fever in the human system. In the bile taken from these cattle were found germs which not only lived, but grew and increased after the manner of those in yeast. The course of growth in the yeast plant was then traced, and the resemblance of the other germs pointed out. In regard to those found in the bile, it was stated, and illustrated by fine drawings, that their development was very largely influenced by the circumstances in which they were placed, one form being found when the growth was in carbonaceous substances, and another very different one when in substances containing nitrogen. Another interesting fact was then stated, showing a very close resemblance between the highest developed form of these plants or germs, and those found in syphilitic diseases. Further developments resulting from close study of these germs may throw light upon the development theory, as well as the different relations of animals. All animals, during their development, go through the forms of all classes of animals below them—the impression of the parent alone deciding how far this development shall proceed.

The cell that causes the fever and ague has certain necessities of growth, as stillness of air and certain conditions of soil. This cell, or germ, when taken up with the breath, produces the fever. It does not rise any great distance from the ground, and hence the greater danger of sitting than standing in places where it abounds. The state of the body has much to do with the effect of the germ upon the system. When, after a full meal and in good health, exposure takes place, the danger is much less than when the stomach is empty and the system tired and exhausted. It will probably be proved that all contageous diseases have a common origin.

The use of the spectroscope has done much for science in the analysis of liquids. The two absorption lines of blood, in spectrum analysis, give us the means of distinguishing blood from any other substance, and showing the presence of any foreign body in the same, as they are never confounded with any others; no two bodies ever producing the same spectrum. In typhus fever the blood discs appear broken up, sometimes flattened and a disc half gone, as though cut in two. We find some poisons useful in disease, and their action may be attributed to their destroying these cells, or their arresting action, as, for instance, carbolic acid in small pox, where, properly administered both externally and internally, it completely breaks up the disease. The effects of arsenic eating are possibly due to the destruction of organic growths in the system rather than its arresting waste.

MR. NASH thought warmth, cat-mint tea, and Saratoga water about the best things for small-pox.

MR. EDWARDS said one of the great errors of society is that people think that two sets of facts cannot be true at the same time, when both of them are true; for example, we are prone to think that either the chemical, the electrical, or the germ theory of disease is the true one, and the others false, as they may all be correct. In the fearful epidemics of 1853, he found that at first the strong and healthy were attacked, and those that had been sick, or were just recovering, were the ones that escaped. As the disease extended all were attacked, and finally the negroes, who had always braved malaria, both in Africa and at the South, fell victims to it. Those who recovered always had been under such treatment as would keep them from getting out of a perspiration; and it was the old nurses and negresses that understood this treatment, and were successful, while the faculty failed.

The theories of disease were then discussed for some minutes, when Mr. ROOT presented his theory of the circulation of the blood and the power of the muscles, which was, in brief, that they acted through the pressure of the blood within them dilating, and so shortening them.

DR. VAN DER WEYDE said this was disproved by several well-known facts, as the elasticity of the arteries which, by their expansion and contraction with the beating of the heart, prevented the transmission of power in this way; also the fact that the blood was only transmitted through the walls of the capillaries by endymosis, and not by pressure.

MR. DUNBAR explained Mr. D. F. L. CHASE'S safety boiler feeder. It was remarked that this apparatus had been previously presented to the society, and described in the proceedings. MR. WIARD objected to it on the ground of its being in a measure a bulk metre. It could not determine how much water was really in the boiler. The weight, the actual amount, is what we want to know, and not the bulk. Some experience of his own went to show that boilers might indicate three guages full, and have the water half way down in reality.

MR. STETSON thought engineers would think it of some importance to keep the apparent water-line constant.

MR. MONTGOMERY illustrated a pear-shaped float guage, that did away with the objections urged against floats, and had many advantages, as it would show the amount of saline material in solution.

MR. WIARD said we could easily have water at the upper guage-cock and steam at the lower.

MR. EMERY—It should be taken, as a rule, that boilers of such a construction should be condemned, they are not safe. He considered a boiler properly constructed in this respect when the difference of the water-level with the engine shut-off was only a few inches. The great objection to these automatic feeders was that they were apt to produce negligence in the attendant, and on several accounts he preferred that there should be nothing of the sort, as this tended to promote the greater carefulness.

MR. HUDSON then exhibited and explained his atomizer, which we have previously described at length in our reports of the meetings of the club.

Missouri Iron and Indiana Coal.

THE *Mississippi Valley Review* of April 16, contains the following highly interesting article on the above topic. We reproduce it verbally on account of the great importance and the commercial bearing of the subject treated, and because it is quite a satisfactory answer to the question, whether the Western States can ever become manufacturing communities.

Iron being the most useful of all minerals, and Missouri being highly favored as possessing within her borders the most extensive deposits of the purest and most valuable ores, there is no subject at present claiming the attention of so large a number of enterprising capitalists as the manufacture of iron. This fact was clearly demonstrated by the number and character of the gentlemen composing the excursion to the Indiana block coal fields last week. Of the several hundred present, very nearly all were practical, thinking, working, business men—from St. Louis, Cincinnati, Chicago, Louisville, Portsmouth, Cleveland, Toledo, Pittsburgh, and even more remote points—either interested now in iron manufacturing, or seeking information with that business in view. The grand festival at the Bates House in Indianapolis, on Wednesday night, was little else than a convention of practical business men; and while the speeches were spiced and flavored with much good humor, a vein of business underlaid the whole, and facts and figures took the place of the "spread-eagle" speeches so common on festival occasions. Inasmuch as many of our readers are anxious to know something of the new coal field, and the Indiana furnaces—and as no other St. Louis paper manifested sufficient enterprise to send a reporter—we give some detaile d information. What are known here as the "Brazil furnaces," (and to which large quantities of Missouri ores are being shipped), are located in and around Brazil, sixteen miles east of Terre Haute. Here are five furnaces in successful operation, and one rolling-mill, with six double puddling furnaces attached. These furnaces are using Missouri and Lake Superior ores, smelt with raw coal, and use no coke. The Brazil furnaces of GARLICK & COLLINS have formerly used two-thirds of Missouri and one-third of Lake Superior ore, but are now using equal parts of each. An average of a week's run shows that they used 3,260 pounds of coal and 3,012 pounds of iron ore in making 2,268 pounds of pig-iron. The block coal, (so-called from the cube shape in which it occurs in masses in the bank), is a partially bituminous coal, between the best Illinois bituminous and the cannel coal.

The block coal deposit of Brazil is seventeen miles east of and parallel with the Illinois State line. The extent of the deposit is about thirty-eight miles north and south and nine miles from east to west. This coal is well adapted to the manufacture of iron. The five Brazil furnaces are all of medium size—ten to twelve feet bosh and forty-five to fifty feet in height. Each turns out from twenty to twenty-five tons of No. 1 pig-iron per day. This Brazil coal field has been developed and all the furnaces built and operated by men from Newcastle, Sharron, and Clarksville, Pa., and Youngstown, Hubbard, and Massillon, Ohio.

Professor Cox, in his forthcoming "Geological Report of Indiana," says: "Block coal has a laminated structure, and splits readily into sheets, that have their surfaces covered with a dull, black, soft, fibrous, carbonaceous matter, resembling charcoal; while, on the other hand, it is difficult to break it in the opposite direction to the laminæ; and this fracture exhibits a splinty structure marked by alternate layers of dull and shining black coal. In coking, it scarcely swells or changes form, and never cakes or runs together. It is this latter character which gives to the "block coal" its peculiar value as a fuel for smelting iron ores, while it has sufficient bitumen to render it highly inflammable; and the blocks retain their shape until burnt to ashes in such a manner as will admit the ready passage of the blast and flame through the entire mass of fuel, ore, and flux. On the other hand, the bituminous, caking coals, of which the Pittsburgh coal may be taken as the type, swell and run together, so that the blast cannot force the flame through the contents of the furnace, and the whole mass becomes chilled for want of sufficient heat to melt the ore.

"Of several analyses made of coal from different banks, we select the following as about an average. This is used by the Planet Furnace Company:

Specific gravity	1,204	Weight of cubic foot, 79 lbs.	
Coke	64.00	Ash, white	2.5
		Fixed carbon	61.5
Volatile matter	36.00	Water	3.5
		Gas	32.5
	100.00		100.00

"An analysis of a picked specimen of Pittsburgh coal gave the following result:

Specific gravity	11.89	A cubic foot weighs 74 lbs.	
Coke	57,9	Ash, white	1.0
		Fixed carbon	56.9
Volatile matter	42.1	Water	1.0
		Gas	41.1
	100.0		100.0

"The superiority of the Star mine coal for fuel is due mainly to the fact of its being an open, free-burning coal, that ignites readily, and will reach the initial heating point in a much shorter space of time than the Pittsburgh coal, which properly renders it of great value as a steam-producing coal, and incomparable for locomotive use."

Professor Cox states that "the coal measures which, in advance of a computation to be made from an actual detailed survey, may be stated to approximate 6,500 square miles, or one-fifth part of the entire State. Insignificant as this coal area may appear when compared to that of the whole United States, which has been estimated at 130,000 square miles, it is, nevertheless, more than half as large as the entire coal area of Great Britain and Ireland."

The following description of the mode of starting or "blowing-in" a blast furnace is given; If the furnace is a new one, it is first dried gradually by kindling a fire upon the hearth. After being thoroughly dried, it is filled well up into the boshes with good seasoned wood. Upon the wood are thrown about ten tons of coke, the quantity being regulated by the size of the furnace. Above the coke the furnace is filled with evenly-distributed charges of block coal, limestone, and a small burden of ore, (say about 450 pounds of ore), 1,800 pounds of block coal, mixed with coke, and occasionally some sticks of wood, and 180 pounds of limestone. The wood is added to prevent the contents from "hanging" or sticking to the sides of the furnace. After the furnace has been filled in this manner to the top, the wood at the bottom is ignited, The fire ascends very slowly to the top, and the contents of the furnace gradually settle down as the wood at the bottom is being consumed. After the contents have settled down to the space that was occupied by the wood, and the surface has reached a bright glow, the charging is resumed, and the furnace kept supplied with a full burden of ore and other material requisite to make No. 1 foundry iron. Only a portion of the blast is turned on for a day or two, after which it is blown with full force. The usual charge for making No. 1 foundry iron at the Brazil blast furnaces consists of 1,545 pounds of a mixture of Iron Mountain specular iron ore, Lake Superior red oxide and magnetic iron ore, scrap and mill cinder, 425 to 475 pounds of limestone (obtained from Hamrick Station or Greencastle Junction), 1,800 pounds of "block" coal (obtained from the mines of the company and Barnett's mine). The ore yields about sixty-eight per cent., and the furnace is ordinarily tapped three times in twenty-four hours. No. 1 foundry iron is made when the furnace is worked with the above charge at its maximum heat. B 1 and No. 2 foundry iron is made from the same charge, when, by some little irregularity, the heat is decreased in the furnace.

To make mill iron, the quantity of the ore in the charge is increased, leaving the burden of coal and flux the same as before. Pig-iron made from Lake Superior and Missouri specular and magnetic ores is always red-short—that is, the metal, made into bars, is easily broken when hot, but is very strong when cold; cold-short iron possesses the opposite properties, and is made from silicious carbonates and the hydrated brown oxides. The dye-stone ores of Tennessee yield a cold-short iron. Silica, phosphorus, manganese, and titanic acid, when present in sufficient quantities in ore, will produce the cold-short properties in the obtained metal.

CONCLUDED NEXT WEEK.

MINING SUMMARY.

The Base Metals of the Pacific Coast—Their Extent and Distribution.

A correspondent of the San Francisco *Bulletin* contributes the following interesting information on the subject, now attracting so much attention and growing in importance:

Gold and silver are generally considered to be the standard by which the value of all other metals is regulated. These have obtained the name of "noble metals" because they are usually found in a native or metallic state, and are not so liable to the action of the atmosphere, or subject to corrosion to the same extent as other metals. Although the term contains a positive chemical significance, it was applied to these metals at a time when the principles of chemical science were utterly unknown. It is to these so-called "noble metals" that California is indebted for the celebrity which it has obtained among the mineral-producing countries of the globe; but its importance as such would have been greatly lessened, and its advancement much retarded, had it not been for the fortunate and opportune discovery of quicksilver also in the State, as the supply of that mineral necessary for the extraction of these metals, obtainable from other sources, would have been utterly inadequate to meet the demand. Quicksilver, although classified among the "base metals," is truly one of the noblest, inasmuch as it is so indispensable for the extraction of the noble metals themselves from the rock in which they are imbedded.

DISCOVERY OF "BASE METALS"—BASE METAL RANGE.

The discovery of the noble metals in California was immediately followed by the discovery of others which obtained the name of "base metals," on account of their supposed inferiority to gold and silver. The application of this term to these metals appears to be limited entirely to California. All metals not entirely free from foreign matter—not in a native state, but require passing through certain chemical processes for the purpose of freeing them from those ingredients which are mixed up with them, and which are considered to debase them, are called "base metals" elsewhere. The base metal ranges of California, Nevada, Utah, Montana, Arizona, and Colorado, are intersected by fissure veins of iron, copper, tin, lead, and zinc, which I would beg to call "useful metals," as being a name much more in accordance with their intrinsic value and general useful character than that of "base metals."

IRON.

Among these useful metals, iron ranks foremost, as much for its usefulness as for the extensiveness of its deposits. It is the most abundant of all metals, and almost as universally diffused throughout the world as gold; but no extensive beds have as yet been discovered on this coast. The deposits existing in the Sierra, and respecting which so much lobbying has been done at Sacramento during the late session of the Legislature, are of very insignificant extent compared with the vast beds in the Eastern States and in Britain. However strange it may appear, it is nevertheless a fact, that pure iron is a greater rarity than pure gold. Such is its affinity for other substances that absolutely pure iron can only be obtained in very small quantities by the chemist by reducing fine oxide of iron in a glass tube, by means of hydrogen, or by the galvano-plastic process. How very appropriately the present age is called the Age of Iron? To it we are indebted for our railroads—the arteries of commerce; for the locomotives which traverse them; and for thousands of appliances which are essential to the very existence of mankind. Its superiority over wood (which it is rapidly superceding,) in the construction of vessels, is already established; and it is as rapidly superseding masonry in the construction of buildings. Great Britain, without her iron, would occupy a very insignificent position among the civilized nations of the globe. Although all metals are specially adapted for certain purposes, nevertheless their capabilities, with the exception of iron, are numerous, and generally one may be efficiently substituted for another; but for the majority of purposes for which iron is used there is no efficient substitute. The annual amount of iron produced throughout the world is estimated at about six millions of tons, and its average value in the pig about $180,000,000, or thirty dollars per ton.

COPPER.

Copper was the metal which was in most general use among the ancients, being converted by them into instruments of warfare, agriculture, and art. The earliest copper mines on record were on the Island of Cyprus, and were extensively worked by the Greeks. The annual production now throughout the world does not exceed 32,500 tons, valued at $13,000,000, and averaging $400 per ton. The large deposits of copper ore existing in this State are generally of so low a grade that they are at present, comparatively speaking, valueless, not being sufficiently rich to pay for shipment to Europe and the Eastern States, and no demand existing for the metal here. It appears as if it were specially designed by Providence that these deposits should be held in reserve for supplying the future wants of the Pacific coast, at that time when they will be absolutely necessary to meet our own demand. Had these deposits been of a higher grade they would have been marketable at once, and undoubtedly California enterprise would have soon stripped the State of this invaluable source of future wealth, much to the injury and detriment of its future welfare.

TIN AND ZINC.

The value of the tin produced throughout the worle is estimated at $8,215,000 per annum; and the produce of zinc, in Europe alone, is estimated at 98,250 tons annually, and valued at $9,826,000, or $100 per ton. The statistics relating to the production in America of this latter metal, cannot be obtained, but, however, it is of very little consequence, as it does not amount to much.

LEAD—DEPOSITS ON THE PACIFIC COAST.

The annual value of lead at present produced throughout the world is estimated at about $21,939,000. The argentiferous lead ores are much more widely and extensively diffused throughout the States and Territories on the Pacific slope, than other mineral deposits, and greatly resemble in character the deposits found in the Hartz Mountains in Germany, celebrated for the large amount of this valuable and useful metal, which is annually extracted from them. The deposits existing in Nevada, Utah, Arizona, and Catalina Island, are much superior in value to those in the Eastern States, from the fact that they generally contain a much larger amount of silver, which enhances its value in a corresponding degree, as the cost of extracting is the same for the one mineral as it is for the other. Most of the lodes in Nevada contain galena; and, although sulphates and carbonates of lead, mixed with more or less antimony, are alone obtained from the present surface workings, it is not unlikely that it will eventually change entirely into galena at a greater depth.

The ores obtained in Utah are galena also, but in a much finer condition than the ores of Nevada, being altogether free from antim ony, containing a considerable quantity of phosphate of lead, and exceedingly rich in silver, varying in yield from 50 to 250 ounces to the ton of 2,000 pounds.

The lodes in Arizona contain large bodies of sulphate of lead, the gangue thereof being fluor-spar. The lodes are also exceedingly rich in galena and blende, mixed with a large quantity of carbonate and sulphate of lime, but the amount of silver contained in them is not as large as that contained in the Utah and Nevada ores, only containing about three-quarters of an ounce for every one per cent. of lead. The lodes of Catalina Island are a mixture of galena and sulphate and carbonate of lead, having a heavy spar as a gangue, and the amount of silver contained in them is even smaller than that in the Arizona ores, being only about one-half ounce to one per cent. of lead.

MODE OF TREATMENT.

These ores are in a very impure state, a large amount of other ingredients being combined with them, demanding the introduction of a thoroughly systematic mode of dressing, and the erection of efficient machinery for that purpose, before the lead can possibly be properly concentrated. The reduction and concentration of ore is almost entirely neglected in the lead mines on this coast, consequently the desired and practicable results are not obtained. From the dirty condition in which the ore is frequently brought by the miners to San Francisco for smelting, it is, much to their surprise, unmarketable; although, had a little care been previously taken in its separation from the gangue, it would bring a very fair price. The present defective system of reduction and concentration is almost entirely limited to a coarse crushing and rough separation of the ore from its matrix, much of which is sent along with it to the smelters. The presence of ingredients contained in this gangue are directly opposed to a successful issue in the smelting process, much of the metal combining with the slag originating from it, and thus becoming lost. As to the mode of treatment most desirable, the character of the ore alone must determine, and the machinery used for the treatment of the ores produced in the same localities differ in character to suit the peculiar nature of the ores subjected to their treatment. The mode of treatment successfully carried out on the ores of one country have been found to operate quite the reverse on the lead ores of other countries. If the ore is disseminated throughout the rock, a fine crushing is necessary for the liberation of the ores from the matrix, prior to its undergoing the process of concentration; but if the ore is in masses throughout the rock, a coarse crushing is all that is requisite, as the brittleness of the mineral and the toughness of the gangue cause them to part easily at the first reduction, while it is quite the contrary with that which is disseminated throughout the rock in fine particles. The success of European lead mines is attributable entirely to the strict attention which has been paid to the particularities connected with the concentration of the ore. Had they attempted to treat their ores in the same careless manner in which they are treated in California, their results would have been a decided failure also.

CAN THE MINER SMELT HIS OWN ORE?

The notion generally accepted in California that the miner can, advantageously to himself, smelt his own ore, is an erroneous one, as the character of the ores themselves suggest, and as the experience obtained elsewhere proves. Many of the lead ores being in an impure condition after concentration, there is no doubt but that it would be much more profitable to the producer to ship them to a locality where they could be mixed and smelted with ores of a purer quality, as it is much easier to extract mineral in small quantities at a time when mixed with purer ores, than from large quantities of poor ore alone. All lead ores contain a certain quantity of silver, and as the cost of separating a small quantity of silver from a large quantity of lead is as much as that of separating a small quantity of lead from a large quantity of silver; and inasmuch as the lead in smelting acts upon the silver in the same manner as quicksilver does on native gold and silver, facilitating its extraction from the rock and efficiently amalgamating, the desirability of smelting the two ores together is apparent; and this affinity which silver has for lead significantly suggests that the latter should be shipped for smelting to that locality wherein large quantities of silver ores can be obtained

From the peculiar condition of its combination with other ingredients, it is obvious, therefore, that men of experience, and specially educated for this business, are the men who alone can be expected to successfully undertake to reduce, concentrate and smelt these ores. England, France and Germany have each its National School of Mines for the education of those who intend to devote themselves entirely to this branch of science, and as many of the ingredients combined with the ores are opposed to a favorable result in their extraction, while others may be present which facilitate the same, its importance cannot be over-estimated. But, although the education received at the Schools of Mines in Europe is valuable and absolutely necessary for the successful treatment of their ores, being specially directed to such, it is not adapted to our mines on account of local peculiarities specially pertaining to our ores, to which the education received ought to agree. To be able to efficiently and successfully treat our lead ores it is requisite that the same should be made our special study, and a School of Mines established in our midst, with the treatment of these ores as a special subject of education. No other mineral requires it as much, as in connection with other minerals have as many changes been made regarding its mode of treatment as in that of lead, which has been undergoing modifications continually during the last ten years.

OUR LEAD IMPORTS.

The United States import from Europe annually from fifteen to twenty thousand tons of lead, which cannot be imported for less than from 6¼ to 6¾ cents per pound, all of which would be clear profit to the home-producer. The valuable and extensive deposits on the Pacific Slope would more than make up this deficiency, providing they were properly and economically worked. The imports of China and Japan also amount to about 12,000 tons annually, all of which is now obtained from England, could be profitably exported from here, as the distance is so very much shorter. San Francisco alone consumes about 3,000 tons annually in the way of sheet lead, pipe lead, litharge, white lead and red lead, some of which are now imported from elsewhere. The large quantities of arsenic, antimony and copper, in the form of matte, which would be obtained by the smelting operations, would be most useful and valuable by-products, and considerably enhance the importance of smelting our own lead.

COMPARATIVE VALUE OF NOBLE AND USEFUL METALS.

The total value of the noble metals obtained throughout the world is estimated at $200,000,000, about two-thirds of this amount being gold; and, in comparing their estimated value with the estimated value of the useful metals, we find a balance of about thirty-three million dollars in favor of the latter, exclusive of the value of the quicksilver and other useful metals not included in this estimate. But the great difference between the noble and useful metals lies in the fact that the latter are greatly enhanced in value by the large amount of labor employed in their treatment, while the former are only slightly increased in value by the aid of labor. An instance of the wonderful manner in which the value of iron is increased by the aid of labor is to be found in the pendulum spring of a watch which governs the vibrations of the balance; weighing only 15.100 of a grain, it costs four cents at the retail price, while the retail price of a pound of the best iron, out of which fifty thousand such springs can be manufactured, also costs only four cents. Many other small and delicate articles are, through the extensive employment of labor in their manufacture, increased to ten thousand times the original price of the raw material.

Thus it is evident that the value of those useful metals cannot be over-rated, and lay claim to our special attention for their development and treatment, which, to be done successfully, demands the assistance of chemistry as applied to metallurgy, inasmuch as they are heterogeneous mixtures of chemical substances combined by laws peculiar to the laboratory of nature.

PROGRESS OF CIVILIZATION AND TREATMENT OF USEFUL METALS CORRESPOND.

In reviewing history, we find that the progress of civilization has kept equal pace with the improvements in the mode of treating these metals, and in their general application for practical purposes; in fact, the present leading civilized nations of the world are indebted for their elevation to the glorious and enviable positions which they now occupy to the economical and the systematic manner in which these useful metals are treated by them, and, at that time when labor will be cheap enough to work them and a demand is created for them in this State, then, and then only, will California attain the height of her glory.

Colorado.

STEWART'S NEW AND OLD REDUCTION WORKS.

The Central City *Herald*, after a recent hurried visit to Stewart's works, Georgetown, gives the following statements: "A run of ten days produced $1,850 73 worth of bullion; fineness .834. There is on hand sufficient ore to run four months; when this is finished it is intended to abandon the present mill and works, for a new establishment, expected to be ready in July, and be able to ship the first bullion by the first of August. At the new works ore will be reduced at a rate of 20 to 25 per cent. less than is now charged on custom lots, enabling ore to pay a profit when valued at $75 per ton, whereas now ore has to realize a little less than $100. The new works are expected to cost from $75,000 to $80,000. The machinery was contracted for in Chicago, to be made after the patterns of like machinery in California. Some car loads have already been shipped to Evans, at a cost of two cents a pound, effecting a saving on the whole cost of freight of $18,000 under the cost of the same amount of stuff three years ago. A saw-mill has also been erected near the same locality. Lumber contracts are on hand for 140,000 feet, at $34 per M. As an evidence of energy and enterprise, we are happy to note such improvements, and heartily congratulate our neighbors of Hard Scrabble on having among them men of the Stewart class."

SUCCESSFUL USE OF THE DIAMOND DRILL.

The following "drilling item" is taken from the Denver *News*: "One of Leschot's patent diamond drills for drilling in mines, quarries, shafting, prospecting, draining mines, tunneling and boring artesian wells, has been running for a short time boring a test hole in Fletcher mountain, Summit county, Colorado, for the Bullion and Incas Silver Mining Company, where they have a tunnel run into the mountain 650 feet. The drilling machine was placed in at the head of the tunnel, and, run with compressed air, carried 625 feet from the compression in 1¼-inch pipe, and bored a horizontal hole 417½ feet deep, taking out a test core one inch in diameter the entire depth, which gave a perfect record and character of the various strata bored through, the test core being ample for assaying purposes."

Arizona.

MORE ABOUT THE GREAT SILVER MINE.

The Arizona *Miner*, April 2, is in receipt of a letter from Granville H. Oury, of Theson, in this Territory, from which the editor extracts the following, regarding the "largest silver lead in the world:"

"It is said the largest and richest silver lead in the world has been discovered near the edge of New Mexico, about 150 miles from this place, near a point on the road known as 'Stein's Peak.' California is all a blaze of excitement over it, and agents of companies are beginning to arrive at this place. I have not seen the ledge, but, from reliable accounts, it is a colossal thing, having no recorded parallel. Knowing ones confidently predict a large influx of people in a short time. I go to visit the place day after to-morrow, and on my return will write you at length."

Should the ledge prove to be as rich and ponderous as its locators assert, the days of the Apaches are numbered in Southern New Mexico and Arizona, and the dreary dullness of that section will shortly be dispelled by energy and activity.

Wisconsin.

SURVEY OF THE LEAD MINES.

The Governor of Wisconsin has appointed Rev. John Murrish, formerly of Mineral Point, now of Mazomania, to survey and investigate the lead mines of that State. He has already commenced his labors in this direction. The Mineral Point *Tribune* speaks of him as follows; "No more fit person in all the State could have been selected for the work in hand than Mr. Murrish. He is a practical miner of wide experience, a thorough, natural geologist, and has been for years directly connected and familiar with the mining interests of the State. He is an active and efficient member of the Wisconsin Academy of Science, Arts and Letters, which society is destined to be one of inestimable value to the State. Mr. Murrish will ere long visit our mines again and develop his plans for the work entrusted to his care."

Idaho.

THE BOISE RIVER MINES.

We learn, says the *Statesman*, April 5, that these mines are yielding beyond expectations. Lambing & Co. worked six days with three hands and cleaned up $327. Walker & Co. have not yet made a clean up. Litell & Co. have sent up supplies, and are preparing to open and work their claims. At Logan gulch, located by W. C. Johnson, and owned by Johnson, Flournoy & Co., they are bringing in a three mile ditch, and will commence work about the first of May. Alexander & Johnson are ready to work; their ground prospects well. Smith & Bros. are at work, but have not cleaned up yet. Several Chinamen are working on the river and doing well.

BUSINESS AND PERSONAL.

[Short notices in this column fifty cents per line each insertion.]

GLYNN'S ANTI-INCRUSTATOR FOR STEAM BOILERS.—THE only and reliable article for removing and preventing incrustation. No foaming, and does not attack metals of boiler. Liberal terms to agents. C. D. FREDRICKS, 587 Broadway, N. Y.
April 19, tf.

MARKET REVIEW.

The Coal Trade.

NEW YORK, April 29, 1870.

WHOLESALE.—The principal feature of the past week was the Scranton sale of 80,000 tons, which took place on Wednesday last, as announced in our last issue, which there was a decline of 12 cents compared with last month's sale. The following table exhibits the prices obtained compared with the March sale:

1870.		April 28.	
10,000 Tons	Lump	$4 20	@ 4 32½
12,000 "	Steamboat	4 20	@ 4 25
16,000 "	Grate	4 40	@ 4 45
10,000 "	Egg	4 52½	@ 4 57½
20,000 "	Stove	5 25	@ 5 30
12,000 "	Chestnut	4 27	@ 4 32½
80,000			

1870.		March 30.	
10,000 Tons	Lump	$4 32½	@ 4 27½
12,000 "	Steamboat	4 40	@ 4 35
13,000 "	Grate	4 60	@ 4 50
10,000 "	Egg	4 80	@ 4 65
25,000 "	Stove	4 50	@ 4 45
10,000 "	Chestnut	4 40	@ 4 30
80,000			

Average for April $4 62, for March $4 46.

The general market is very quiet. Retailers are doing a very light business in consequence of the numerous removals taking place this year, which makes an unsettled community; the very warm weather also has checked business.

The Pennsylvania Coal Company's circular of April 27, gives the following prices for coal delivered at Newburgh: Lump and steamer, $4 80; grate, $4 90; egg, $5; stove, $5 45; chestnut, $4 60.

The men in the Schuylkill region are yet on a strike, and information reaches us this week that the miners in the Lehigh region went out on Saturday last the 18th inst. The avowed object of this last strike is to advance the price of coal in the market by decreasing the supply. This is entirely wrong and nothing short of an imposition upon consumers. The miners having been successful during 1869 in many of their strikes, are becoming bold and defiant, and insist upon being the governing element in the various coal-producing regions. That capital should thus be made entirely subservient to the caprice of labor is most damning; we are not afraid but that it will prove itself thus ere the present controversy is ended. We have showed in previous articles that there is no sense in the miners endeavoring to maintain the rate of wages of 1869, inasmuch as everything that they consume, and, furthermore, the price of coal, has declined in sympathy with other articles of consumption, and that a further decline will take place. There is no heavy demand for coal in this market. The weather is warm, and very little is being consumed; there is a good stock on hand here and at the East, and the Delaware & Hudson Company have some 600,000 tons piled up at Honesdale. Manufacturing business in all lines is much depressed, and very little demand comes from this source, and our advice to dealers is to keep cool and buy in small lots. The various new routes of railroad transportation to tide-water established during the past few years enables us to bring coal to market now at any period of the year, and as the local roads in the various parts of the State are constantly increasing their transportation facilities, there is no danger but that the wants of all can be readily supplied at any time of the year. These matters are much changed to what they used to be, and the old fogy manner of piling up huge mountains of coal in our yards should be done away with, now that we no longer depend entirely upon canal transportation as formerly, which can only be carried on during the warm weather.

Where is the genius of our inventors at this critical moment? We want coal cutting machines—instruments that will not dictate to the capitalist when he invests his millions in one of the great industries of the country, and which now, by these repeated strikes, is placed in great jeopardy. The miner has almost driven the operator into the "last ditch," and should have an eye to the consequences. They have certainly, of late, brought themselves into bad repute, and no doubt have been led away by a few vain leaders, who seek power and position. The press throughout their district have repeatedly warned them of the position they were being led into, and a continuance in their present attitude will, and must, only end in causing some means to be adopted tha will bring them to their senses. We certainly think that so valued an industry as the coal trade, and one in which so many millions of capital is represented—an article of consumption that trifling with, affects and cripples so many of our manufacturing and building enterprises—an article of consumption, the enhancing of the price of which must necessarily bring distress, particularly upon the poorer classes—some steps should be taken by Congress or the commonwealth of Pennsylvania to wrest its control out of the hands of these ignorant men and their unscrupulous leaders. We do not believe that the masses of the people of this country should be made to submit to extortion by these persons, and will not, and no doubt our representatives in Congress will take some steps to remedy the evil.

ITEMS.

The *Miners' Journal* of the 23d says that the quantity sent by railroad this week is 14,974 tons; by canal, 1,074; for the week, 16,038 tons, against 111,993 tons for the corresponding week last year. Part of these 16,038 tons were not mined this week, but taken from the schutes, so general is the suspension. Nor is the demand for coal very brisk. A purchaser refused this week to pay over $3 a ton for egg and stove, to send to Richmond for shipping. This does not look like resuming for some time yet; even if the men were to accept the basis prices offered by the operators and go to work, we doubt very much if the basis price of $2 50 per ton could be maintained over two or three weeks if the trade were pushed. Under these circumstances the operators cannot resume, and they will not resume unless the men comply with the basis offered; and even then it is doubtful if they could secure their portion of the trade, as many of their customers, who generally contracted with them in the Spring of the year, have been driven off to other points to secure a portion, at least, of their supplies. A large number of collieries have been drowned out by the recent heavy rains, and could not work under any circumstances.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending April 23, 1870, compared with week ending April 24, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Phila. & Reading R.R	94,408	1,060,465	16,936	814,990
Schuylkill Canal	25,771	115,516	1,074	19,793
Lehigh Valley R. R., N			3,765	92,686
" " S	54,335	825,847	54,312	970,950
L. Coal & Nav. Co. R.R.	14,722	246,688	21,710	268,748
Lehigh Canal	32,517	96,421	4,082	23,949
Scranton North	11,488	161,122	12,085	190,559
" South	28,702	472,640	35,620	518,302
Penn. Coal Co., rail	21,516	236,652	24,926	903,068
" " canal	1,070	1,070	1,066	1,352
Del. & Hud. Canal Co.	51,567	134,533	46,742	112,187
" " R. R.	5,282	84,093	10,717	117,192
" " south	3,552	31,112	10,147	85,913
Shamokin	9,485	106,134	5,875	86,913
Trevorton	570	6,908	1 912	72,005
Lykens Valley Coal Co.	1,415	14,402		
Wyoming South				570
" North			3,765	93,169
P. N. Y. C. & R. R. Co.			5,974	74,993
Williamstown, Col'y	3,897	43,227		
Short Mountain	2,665	21,160		
Total	362,952	3,649,938	260,718	3,846,809
1869	360,718			3,649,938
Decrease week and year	2,234		Incr'se	196,871

* Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending April 23, 1870, compared with week ending April 24, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.	19 964	240,555	20,227	209,566
C. & O. Canal	17,994	61,331	18,027	46,223
H. & B. T. R. R.	7,468	93,742	7,393	81,616
Harrisburg & D.			13,950	165,781
L. V. R. R.			864	5,156
P. & N.Y. C. & R. Co.			1,769	61,528
	44,426	395,628	62,230	569,870

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending April 21, 1870—less coal carried for Company's use, and Bituminous Coal:

For week	16,936 05
Previously this year	798,054 06
Total	814,990 11
Same time last year	1,050,465 00
Decrease	235,474 09
Amount sent same week 1869	94,408 00

Report of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, April 21, 1870:

From St. Clair	1,388 11
" Port Carbon	763 07
" Pottsville	83 10
" Schuylkill Haven	8,820 05
" Auburn	725 07
" Port Clinton	2,825 04
" Allentown and Alburtis	2,329 17
" Harrisburgh and Dauphin	13,950 14
Total paying freight	30,886 19
Coal for Company's use	2 577 03
Total for week	33,464 02
To same time last year	994,559 09
Total	1,028,023 11
To same time last year	1,159,679 10

Report of coal transported over the Schuylkill Canal for the week ending Thursday, April 21, 1870.

	Tons. Cwt.
From Port Carbon	439 00
" Pottsville	
" Schuylkill Haven	635 00
" Port Clinton	
Total for week	1,074 00
Previously this year	18,719 12
Total	19,793 12
To same time last year	115,516 15

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, April 23, 1870.

	WEEK.	SEASON.
North	46,655 11	678,018 17
South	10,146 19	85,913 03
Total	56,802 10	763,932 00
Corresponding time in 1869.		
North	40,773 09	578,975 13
South	3,552 00	29,394 16
Total	44,325 09	608,370 09
Increase North	5,882 02	Increase 99,043 04
Increase South	6,594 19	Increase 56 518 07
Total Increase	12,477 01	Increase 155,561 11

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending April 23, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons ct	WEEK, 1869. tons ct	YEAR, 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	26322 15	18471 14	274675 18	187139 04
Upper Lehigh Region	4064 13	3158 14	26677 18	49816 09
Mahanoy Region		199 00		345 15
Hazleton Region	891 15	9825 02	11012 00	30218 16
Beaver Meadow Region	817 08	8403 05	6632 02	13908 09
Mauch Chunk Region		12422 15	30089 18	88776 03
Totals	32096 11	48880 10	349087 16	370274 16
Increase				
Decrease	16783 19		21187 00	
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	21710 07	14722 11	268748 18	246668 10
Forwarded East of Mch Chunk by Canal	4082 07	32517 15	23949 09	96421 16
Delivered at and above Mauch Chunk	904 07	1092 15	11588 13	12580 12
Delivered to L. & B. R. R. at PlymouthBridge	5399 10	547 09	44800 16	9503 15
L. V. R. R. at Sugar N.				5100 03
Totals	32096 11	48880 10	349,087 16	370274 16
Of the above there was from Mines controlled by Co., W.B.C. & L.Co	12277 10	9459 04	104,208 02	92137 05
L. C. & N. Co	963 00	13559 19	45430 02	88776 03
Totals	13240 10	23019 03	149,636 04	180913 08
Increase				
Decrease	9778 13		$1277 04	

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending April 21, 1870:

	Tons.
For week	13,950 14
Previously this year	151,830 15
Total	165,781 09

Report of Coal Transported over Lehigh Valley Railroad

For the week ending April 23, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREVL'Y. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	11,680 15	215,451 02	227,132 17
" Hazleton	39,409 06	553,597 19	593,007 05
" Upper Lehigh	403 12	3,782 14	4,246 06
" Beaver Meadow	7,685 07	183,469 10	191,154 17
" Mahanoy	1,513 12	91,875 17	93,419 09
" Mauch Chunk		447 17	447 17
Total Anthracite	60,782 12	1,048,624 19	1,109,407 11
Bituminous Coal recv'd from Cata. R. R.			
N. C. R. R.			
E. P. R. R.	864 00	4,292 00	5,156 00
P. & N.Y. C. & R.R. Co			
Fall Creek			
Schroeder			
Towanda			
Total by rail and canal	61,646 12	1,052,916 19	1,114,563 11
Same time last year	70,371 13	837,147 14	907,519 07
Increase	8,725 01	215,769 05	207,044 04
Decrease			
Forwarded East from M'h Chunk by rail	54,312 18	916,637 07	970,950 05
Same time last year	54,335 14	771,511 18	825,847 12
Increase	22 16	145,125 09	145,102 13
Decrease			

RECAPITULATION.

Forwarded East from M'h Chunk by rail	54,312 18	916,637 07	970,950 05
To N. C. R. R., at Mount Carmel		115 00	115 00
Forwarded North from L. & B. Junction	3,765 05	88,921 02	92,686 07
To L. & S. R. R. at Packerton for rail	43 02	3,071 02	3,114 04
Delivered at M'h Chunk	9 09	507 07	516 16
Delivered on line of road above Mauch Chunk	130 00	5,893 16	6,023 16
Delivered above M. Chunk for use of L. V. R.R.	845 08	19,444 10	20,289 18
To L. & S. R. R., at P'n Hav., for railroad	859 02	7,485 10	8,344 12
Do. for canal	817 08	6,549 05	7,366 13
At M.Chunk for canal			
Total Anthracite	60,782 12	1,048,624 19	1,109,407 11
Bituminous Coal	864 00	4,292 00	5,156 00
Total all kinds	61,646 12	1,052 916 19	1,114,563 11

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via. the Pennsylvania and New York Canal and Railroad Company, for week ending April 16, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	3,765 05	89,404 07	93,169 12
Bituminous	1,769 00	59,759 00	61,528 00
Total, Ant. and Bit.	5,534 05	149,163 07	154,697 12

Cumberland Coal Trade.

B. & O. RAILROAD.

The shipments over the Baltimore & Ohio Railroad for the week ending April 23, 1870, were as follows:

From Georges Creek via Piedmont.

	Tons.
Consolidation Co	3,357 04
Borden Co.	1,418 19
Midlothian Co.	347 17
G. C. & I. Co.	2,392 12
S. M. Johnson and others	1,665 03
Hamp. & Bait. Co	
From Eckhart R. R.	
Spruce Hill Company	310 00
Consolidation	1,818 18
Total	11,310 13

Coal Trade by Canal.

For the week ending April 23, 1870, there were cleared at the port of Cumberland 170 boats laden with coal, shipped by the several companies, as follows:

American	4,118.18
Borden	2,321.14
Consolidation	3,516.17
do Eckhart Mines	1,080.06
George's Creek Coal and Iron Co.	216.18
Hampshire & Baltimore	1,310.11
Maryland	4,971.14
Midlothian	544.11
James Boyce (from Eckhart)	1,206.16
R. G. Rieman & Co., do	1,576.16
J. B. Turton, (Hamp. & Balt.)	331.03
B. McQuade (Cooke Mine)	115.01
Glenn & Gleason, (Cooke)	108.08
	21,418.02

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, April 23, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	TOTAL. Tons. Cwt.
1870	18,027 14	20,227 17	38,255 11
1869	17,994 00	18,964 1·	36,958 16
Increase	32 14	1,263 01	1,296 15
Decrease			

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	46,223 18	209,566 14	255,795 12
1869	61,331 03	240 555 04	301,886 07
Increase	15,102 02	30,688 10	46,090 15
Decrease			

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven $2 00

From Port Carbon, 8 cents per ton more.

Less drawback of 80 cents on all Coal shipped east of New : runswick and south of Cape Henry.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 81
C. R. R., N. J., Easton to Elizabethport	1 12
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 28

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 81
C. R. R., of N. J., Easton to Pt. Johnson	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 81
Morris & Essex R. R. Easton to Hoboken	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO SOUTH AMBOY.

L. V. R. R.	81
B. & D. R. R. / Cam. & Am. R. R.	1 09
Shipping Expenses,	25
Total	$2 15

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	95
C. RR. of N. J. Easton to Elizabethport	1 19
Shipping expenses	25
Wharfage	10
Total	$2 49

BY CANAL.

Via Schuylkill Canal.

TO PHILADELPHIA.

From Schuylkill Haven	$1 07
" Port Carbon	1 10
" Port Clinton	1 00

TO NEW YORK.

From Schuylkill Haven	$1 70

Via Lehigh Canal.

TO PHILADELPHIA.

Lehigh Canal	$0 70
Freight and towage	1 07
Total	$1 77

TO NEW YORK.

Lehigh Canal	$ 40
Morris " / Freight / Towing	1 10
Total	$ 2,50

TO JERSEY CITY.

Lehigh Canal	$ 40
Morris " / Freight	2 00
	2 40
For re-shipment	2 20
Total	$

Via Delaware and Raritan Canal.

TO NEW YORK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1,25
Towage	20
Total	$ 2,50

TO NEW BRUNSWICK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1,05
Total	$ 2,10

For Re-shipment—30 extra for shipping, and 10 cents. drawback.

Towing Rates.

TO EASTERN PORTS.

	Per Ton.
To New Haven	$ 40
Bridgeport	40
Southport	40
Westport	40
Norwalk	40
Stamford	40
	Per Boat.
Greenwich	$70 00
Port Chester	80 00
Mamaroneck	70 00
Glen Cove	55 00
New Rochelle	55 00
East Chester	60 00
West Chester	30 00
White Stone	30 00
College Point	25 00
West Farms	25 00
Flushing	30 00
Harlem and Mott Haven	20 00
Port Morris	20 00
Ninety-first street and Astoria	16 00

Boats beyond Port Chester, with less than 200 tons, $80 per Boat.

TO RIVER PORTS.

Boats of 150—250 Tons.	Per Ton.
To Manhattanville	8 cents
Spuyten Duyvil	8 "
Yonkers	9 "
Hastings	10 "
Piermont	12 "
Dobbs' Ferry	12 "
Nyack	14 "
Tarrytown	15 "
Sing Sing	16 "
Croton Landing	17 "
Haverstraw	17 "
Verplanck's	17 "
Peekskill	18 "
West Point	20 "
Cold Spring	20 "
Newburgh	18 "
Poughkeepsie	22 "
Rondout	23 "
Boats of 100 Tons	Per Boat.
To Manhattanville, and Return	$11 00
Spuyten Duvvil, "	13 00
Yonkers, "	15 00
Sing Sing, "	20 00
Peekskill, "	25 00

Freights.—APRIL, 1870.

TO EASTERN PORTS.	From Philadelphia.	From E. Port and Port Johnston	From Newburg	From Rondout
Amesbury	$2 75	$ — —	$ 1 75	$
Bangor	2 75	— —	1 75	
Bath	2 75	2 00	1 90	2 00
Boston	2 60	1 85	1 80	1 25
Bridgeport	1 65	1 00	1 50	
Bristol	2 00	1 40	1 45	
Cambridgeport	2 50	2 00	1 90	
Derby	2 00	— —		
Dighton	— —	— —	1 50	
East Cambridge	2 50	2 00	2 00	
Fall River	1 75	1 40	1 45	
Hackensack	1 95	1 50		
Hartford	2 75	1 50		
Jersey City	1 75	50		
Middletown	— —	1 25		
Mystic	2 00	1 40	1 35	
New Bedford	1 75	1 50		
Newburyport	2 00	2 00	1 90	
New Haven	1 10	1 00	1 20	1 25
New London	2 00	1 20	1 30	1 40
Newport	1 75	1 40	1 45	
New York	1 25	50	70	
Norwalk	1 75	1 00	1 15	
Norwich and tow	1 70	1 40	1 40	1 50
Pawtucket	1 90	1 50	1 65	
Portland	1 75	1 75		
Portsmouth, N. H	2 25	2 15	1 90	2 10
Providence	1 75	1 40	1 50	1 55
Rockport	2 10	— —		
Saco	2 50	2 10		
Sag Harbor	2 00	1 40	1 35	
Salem	2 25	2 00	1 80	2 00
Stamford	2 00	1 00	1 10	
Stonington	2 00	1 40	1 30	
Taunton	2 75	2 00		
Warren	— —	1 40	1 50	
Washington	1 10			
TO RIVER PORTS.				
Albany		1 00	— 60	
Catskill		— —	— 50	
Cocksackie		— —	— 50	
Coeyman's		— —	— 75	
Cold Spring		— —	— 35	
Fishkill		— —	— 30	
Haverstraw		50	— 60	
Hudson		— —	— 50	
New York		— —	— 70	
Nyack		50	— 60	
Poughkeepsie		— —	— 35	
Rhinebeck		— —	— 30	
Rondout		— —	— —	
Saugerties		— —	— 40	
Sing Sing		— —	— 60	
Stuyvesant		— —	— 55	
Tarrytown		80	— 75	
Troy		1 00	— 75	
West Point		— —	— 35	
Yonkers		40	— 60	

Foreign and Provincial Freights.

April, 1870.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£13 10@£14 10
Liverpool	12s.6d@14.ton
TO NEW YORK.	
Provincial	
Sidney	$—
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—
TO BOSTON.	
Sydney	$—
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

Prices of Coal by the Cargo,

[CORRECTED WEEKLY.]

	AT NEW YORK, April 29.		AT PHILADELPHIA, April 28.	
SCHUYLKILL.	R. A.	W. A.	R. A.	W. A.
Lump	$— —	$5 00	4 50	— —
Steamer,	— —	5 25	— —	— —
Broken,	— "	— —	— —	4 50 to — —
Egg	5 75 to 6 25	5 50	— —	4 50 to — —
Stove	— —to—	6 00	— —	4 50 to — —
Chestnut	4 50 to 5 40	5 00	— —	4 00 to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	6 00	— —	— —	— —
Broken	6 00	— —	— —	— —
Egg	6 00	— —	— —	— —
Stove	6 25	— —	— —	— —
Chestnut	5 50	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A.	— —	— —	— —
New England	"	— —	— —	— —
Locust Dale	W. A.	— —	— —	— —
Honey Brook, Le'h	W. A.	4 75 to 5 75	— —	— —
Spring Mountain	"	4 75 to 5 75	— —	— —
Sugar Creek	"	4 75 to 5 75	— —	— —
Sugar Loaf	"	4 75 to 5 75	— —	— —
Old Comp'y's.	"	4 75 to 5 75	— —	— —
Cross Creek	"	4 75 to 5 75	— —	— —
Enterprise	"	— —	— —	— —
Girardville	"	— —	— —	— —
McMichael	"	— —	— —	— —
Shamokin	"	5 50	4 50	— —
Lykens Valley	"	— —	— —	— —
Broad Top	"	5 50	— —	— —
Hill & Harris	"	— —	4 50	— —
Henry Clay	"	— —	4 50	— —
Powelton	"	5 50	4 50	— —

Prices for Coal at Mauch Chunk.

	F.L.	Bro.	Gra.	Eg.	Sto.	Cst.
Lehigh	$3 50	$3 50	$3 50	$3 50	$4 00	$3 25
Wilkesbarre	3 50	3 50	3 50	3 50	4 00	3 25

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein	f.o.b. at Phila.	$5 00
Lemon	" " "	4 75
Cumberland Vein Coal		5 00
Cumberland C. & I. Co.'s on board	N. Y.	7 00
Maryland Coal Co.	"	7 00
Consolidated Coal Co.'s	" "	7 00

[*Dealers in these coals may be found in our advertising columns.]

Company Coals.

	L.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	4 50	4 60	4 75	5 00	5 75	4 60
Pittston at Newburgh	4 50	4 80	4 90	5 00	5 45	4 75
Lackawana at Rondout	4 50	4 85	4 90	5 10	5 75	4 50
Wilk'b're at Hoboken	4 75	4 75	4 75	5 25	5 75	4 75
Old Co. Lehigh at Pt. Johnston	— —	— —	— —	— —	— —	— —
Lehigh at E. Port	5 50	5 25	5 25	5 25	5 75	4 75

For freights to different points, see "Freights."

Prices of Foreign Coals.

May, 1870.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	10 00@12 00
" House "	13 50@15 50
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs., delivered.

Prices of Gas Coals.

May, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 73 Pine st., N.Y.

Duty, $1 25, gold.	Coarse.	Slack.
Block House	$1 75	@- 75
Gowrie	1 75	@- 75

Corrected by Bird, Pickens & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@- 80
Lingan	1 75	@- 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Coarse. Currency.	Slack.
Fairmount Gas Coal Co. of N. Y.	7 50	@- —
Despard Coal Co	$7 50	@- —
Penn	— —	@- —
Newburg Orrel Gas	— —	@- —
West Fairmount Gas Coal	— —	@8 00

AT PHILADELPHIA.

Powelton	$7 80

Prices at Baltimore—May, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$6 60@6 75
Pittston and Plymouth	6 00@6 50
Shamokin Red or White Ash	6 00@6 25
Lykens Valley Red Ash	— —@6 50
Zerba Valley	6 00@6 25
Trevorton, Red Ash	6 00@6 50
By retail, all kinds per ton of 2240 lbs.	7 25@8 50
Georges Creek & Cumberland f. o. b. at Locust Point for shipping	— —@5 00
West Fairmount Gas f. o. b.	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

May, 1870.

George's Creek and Cumberland f. o. b. for shipping..$4 75

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@— —
Lykens Valley	— —@— —
Shamokin Red or White Ash	— —@— —
Trevorton and Zerba Valley	— —@— —

METALS.

NEW YORK, April 27, 1870.

IRON.—Duty: Bars, 1 to 1¼ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1½ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

	Store Prices.
Pig, Scotch No. 1, ₱ ton	32 00@36 00
Pig, American, No. 1	33 00@34 —
Pig, American, No. 2	31 —@32 —
Pig, American, Forge	30 —@31 —
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@97 50
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	115 —@125 —
Bar, Refined " "	77 50@ — —
Bar, Common " "	72 50@ — —
Scroll " "	87 50@115 —
Ovals and half-round " "	95 —@110 —
Band " "	95 —@ — —
Horse Shoe " "	93 —@ — —
Rods, ¼ to 5-16 inch " "	85 —@120 —
Hoop " "	105 —@145 —
Nail rod, less 5 ₱ ct.	— 7 @—7¼
Sheet, Russia, as to Nos. (gold)	— 11—@—12—
Sheet, Single, D, and T. Common	— 4¾@— 6½
Sheet, Galv'd, Nos. 14 to 26 List 15, 16 and 17 c.	25@30 ₱c. off
Rails, English (gold), ₱ ton	59 00 @60 00
Rails, American, at Works in Pa	71 00 @72 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 2½ cents ₱ lb, and 10 ₱ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₱ lb	— 15 @— 18
English Spring (2d and 1st quality)	— 7 @— 10
English Blister (2d and 1st quality)	— 10 @— 17
English Machinery	— 11½@— 14
English German (2d and 1st quality)	— 13 @— 15
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— — @— 18
American, Spring, do.	— 9 @— 12
American Machinery, do.	— 10 @— 12
American German, do.	— 10 @— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₱ lb	— @— 31
Copper Bolts	— @— 31
Copper Braziers, 16oz. and over	— @— 31
Copper Nails	36 @— —
Copper, Old Sheathing, &c., clean	17 @— 18
Copper, Chili Pig	— @— —
Copper, American Ingot	18¼@— 19
Yellow Metal, New Sheating	24 @— —
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	@— 24

LEAD.—Duty Pig, $2 ₱ 100 lbs.; old Lead, 1½ cents ₱ lb; Pipe and Sheet, 2½ cents ₱ lb.

Galena, ₱ 100 lbs	$— @— —
Spanish (gold)	6 20 @6 25
German, do.	6 20 @6 37½
English, do.	6 20 @6 62½
Bar (net)	— — @ 7 70
Pipe and Sheet (net)	— — @ 7 70

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	37 @38
Straits	33½@34
English	— @34

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₱ box	$8 75 @9 —	$10 25 @10 75
I. C. Coke	7 — @7 75	8 25 @ 9 —
Coke Terne	6 — @6 75	7 — @ 7 25
Charcoal Terne	7 75 @8 25	9 — @ 9 75

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100 lb.

	Gold.
Plates, Foreign ₱ 100 lbs.	$6 00 @6 12½
Plates, Domestic ₱ lb.	10 @- 11½

REMARKS.

IRON.—The demand for Scotch Pig continues active, and prices have further appreciated. We quote $33 @ $36 for all brands; 200 tons Gartsherrie, from yard, sold at $35, now held at $36. There has been a little more inquiry for American Pig, and we notice sales of 2,000 @ 3,000 tons, delivered at Philadelphia, at $33 for No. 1 and $31 for No. 2; and 2,000 do. Gray Forge, at the furnace, $30. Wrought Scrap is scarce, and in few hands, and held very firmly; 250 tons No. 1 sold from yard at $42 25, currency; and 100 tons on private terms—now held at $42 50. The demand for Rails has in a measure subsided, but prices remain as previously quoted. Bar from store, as for a long period, continues depressed, and there are no indications of improvement. Swedes Bar has seldom been so scarce, many sizes being entirely out of stock, so that an order for usual assortment could not be filled at any price.

LEAD.—Pig remains quiet, but in prices there is no change; 50 tons Spanish sold, ex ship, at 6½ cents, gold. Bar, Pipe and Sheet, $7 70 per 100 lb., net cash.

COPPER.—New Sheathing remains steady at 31 cents, and Yellow Metal do., 24 cents, cash. The export movement in Ingot, alluded to in our last, embraced about two millions of pounds of all kinds, say 350,000 lb. Baltimore, at 14¼ cents; 200,000 lb. Minnesota, including all their last season's product, 20c.; some Quincy, 15½c.; the residue Lake, 14⅞c. @ 15c., all gold. It was supposed that these purchases would have relieved and strengthened the market, but we find it still dull and drooping. The sales are 50,000 lb. Baltimore at 18¾ cents; and 50,000 lb. Lake, 19 cents, cash.

TIN.—With the present very light stock of Pig, the business is necessarily limited, and we have only to notice the sale of 100 slabs Straits at 33⅞ cents; and 150 do., 34 cents; English, 34 cents; and Banca 37 @ 38 cents, all gold. The demand for Plates, stimulated by the causes noted in our last, continues active, and the advance in prices then noted is well sustained, the market closing on yesterday at rather higher rates; sales have been made of 1,000 bxs. ¼d X Charcoal Tin at $8 75 for I C; 500 do. I C Coke, 10 by 14, $7 25; 1,000 do. Charcoal Terne, $7 25; 6,000 do., medium grades, $7 37½ @ $7 62½; 750 do. Coke Terne, $5 75 @ $5 87½; 350 do., a superior brand, $6 25, all gold; and 300 do. I. C. Coke Tin, at a private price.

SPELTER.—Foreign remains very dull, and we have only to notice the sale of 10 tons V. M. at 6 cents, gold.

ZINC.—American Ox. Zinc, 6½ @ 7c.; French do., 9½ @ 10c.; Sheet Zinc, 8¾ @ 9½c.

MANGANESE.—Ox. Manganese, 4 @ 4½c. per lb.

Mining Stocks.

NEW YORK, April 27, 1870.

No material change has transpired in Mining stocks. Gregory sold this A.M. for from $1 70 to $1 75. Sales of Grass Valley were effected at 26c., and of Black Hawk at 26 @ 27c. Our quotations in another column exhibit the condition of the market to date.

Sales of Bergen coal and oil "Petroleum" were effected this A.M. at 40c., and United Petroleum Farm at 25c. Home is quoted at from $4 25 to $5, which shows a decided advance from our last quotations. Below is the latest report of the Stock Board:

	Bid.	Asked.
Bennehoff	25	31
Bergen Coal and Oil	40	41
Bliven Oil	35	1 00
Brevoort	1 00	— —
Buchanan Farm	43	45
Central	55	60
Pithole Creek	1 30	—
Rathbone	25	—
Rynd Farm	30	35
Second Natioanl	—	75
United Petroleum Farms	24	2
United States	75	—

San Francisco Stock Market.

From all quarters of the California and Nevada mining sections we have reports of the most active operations going on, the most liberal inducements being offered for labor, and the demand for mining machinery far exceeding the supply.

We cannot but reiterate our complaint at the meagreness of the official report of the San Francisco Stock Market transactions. *Et verbatim*: "San Francisco, April 27, 1870.—Gould & Curry, 1st Board, $1 55; 2d Board, $1 60." A telegram to the Associated Press, dated San Francisco, April 23d says that Mining Stocks during the week have been active and irregular, closing with a general decline.

SAN FRANCISCO, April 19, 1870.

	1st Board.	2d Board.
Savage	55	55½
Crown Point	—	—
Yellow Jacket	49¾	50½
Kentucky	86	85
Chollar Potosi	—	30
Gould & Curry	1 55	1 60
Ophir	—	—
Alpha	—	—
Belcher	25	24½
Imperial	48	—
Hale & Norcross	—	—
Amador	—	—

THE first bar of tin made in the United States has been presented to the Secretary of the Association of California Pioneers, in San Francisco. It is eight inches long, four inches wide, and two inches thick. The bar is appropriately inscribed.

MINING COMPANIES AND STOCK QUOTATIONS.

GOLD AND SILVER COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
Alameda Silver		A. Queran, 108 Wall st	$2,000,000	$10 00		
Ada Elmore	South Boise, Idaho					
American Flag	Nevada District, Col.	P. P. Fullerton, 71 B'way	600,000	10 00		
Atlantic and Pacific	Humboldt Co., Nevada.					
Bates and Baxter	Colorado			50 00		
Benton	Colorado	W. F. Drake, 15 Broad	500,000	5 00		05@10
Briggs	Colorado	J. P. Davies, 19 Cliff	1,000,000	100 00		
Black Hawk	Colorado	C.T.Whittington, 48 Broad	2,500,000	100 00	25	26
Bobtail	Colorado	J. Stanton, Jr., 25 Nassau	1,000,000			
Bullion Consolid'ed Gold	Colorado					
Burroughs Gold	Colorado					
Central Gold					23	26
Consolidated Gregory	Colorado				1 65	1 70
Combination Silver	Nevada			100 00		1 50
Columbia Silver	Austin, Nevada	J. M. Brown, 155 B'way	5 000,000			
Commercial Silver		J. E. Smith, 26 Pine	3,000,000			
Corydon	Gilpin Co., Colorado	J. Samuels, 40 B'way	500,000			
Downieville	Colorado		2,500,000	25 00		
Eagle Gold	Gold Dirt Dist., Col.	J. P. Davies, 19 Cliff	300,000	1 00		
Empire Gold and Silver	BodieBluff,MonoCo.Cal	H. K. Gates, 70 B'way	1,000,000			
Edgehill		A. Fullerton, 71 B'way	10,000,000			
Esperanza Silver		Ezra Clark, Jr., 13 William	400,000			
Fisk Gold		H. Johnson, 195 Fulton	500,000			
Forest Queen		E. B. Beet, 62 B'way	1,000,000			
Golconda Gold	Sherbrooke, C. E.	H. Adams, 71 Broadway	2,000,000			
Gunnell Gold	Colorado	J. H. Rolston, 80 B'way	1,000,000	50 00		50
Gunnell Central	Colorado	C. B. Bostwick, 16 B'way	3,000,000	10 00		
Gold Rock		R. M. Lockwood, 93 Wall	400,000			
Grass Valley					24	27
International Silver		J. W. Brazier, 26 Pine	600,000			
Hope Gold	Colorado		5,000,000			
Holman			2,000,000	25 00		
Kipp & Buell	Colorado		300,000			
Knickerbocker Gold		J. H. Rolston, 80 B'way	200,000	100 00		
La Crosse Gold	Nevada Dist., Col.	P. P. Fullerton, 71 B'way	1,000,000		8	12
Lander Hill T. & S	Nevada	M.L.Catherwood,74 B'way	1,000,000			
Lewis Gold	Georgia		1,000,000			
Liberty Gold						01-02
Manhattan Silver	Nevada	M. L. Ogden	400,000			
Maraposa common	California	Jas. H. Ferdon, 34 Wall	12,000,000		6¼	
Mariposa preferred	California	do. do.			13½	14¼
Montana Gold		G. De Cordova	400,000		4	5
Montana M. L. & M. Co.	Montana	A. M. Hoyt, 22 William	250,000			
Montrose	Clear Creek Co., Cal.	W. W. Perkins, 71 B'way	1,000,000			
New York Silver	Nevada	Thos. Sproull, 78 B'way	1,500,000			
New York and Austin	Nevada	E. R. Siccomb, 70 Wall	500,000			
New York and Owyhee	Owyhee Co., Idaho		1,000,000			
New York and Eldorado		G. H. Munroe, 10 Wall	2,000,000			
N. Y. & Montana M. & D.	Montana	F. A. Chapman, 20 Nassau	1,250,000			
N. Y. & Silver Peach	Nevada	R. C. Root, 74 B'way	2,000,000			
N. Y. & Utah P. & M		W. H. Mailler, 108 Wall				
Nye						
Ophir Gold	Comstock Lode, Nev.	L. C. Warner, 70 B'way	625,000			21
Owyhee Gold		W. H. Smith, 43 Ex. Place	1,700,000			
Pahranagat Central	Nevada	J. E. Smith, 25 Pine	6,000,000			
Quartz Hill Gold		F. Bernard	2,500,000		28	40
Reese River Consol'd	Nevada	W. B. Ogden	6,000,000			
Rocky Mountain	Colorado	S. M. Pond, 70 B'way	500,000	10 00		5
Rollins Gold		Thos. Bond, 132 B'way	600,000			
Sensenderfer	Colorado	H. A. Shewill, 19 Broad	1,000,000		1 00	
Silver Bend		F. W. Macy, 20 Nassau	1,500,000			
Silver Mt. Silver		H. A. Moen, 71 B'way	1,000,000			
Silver Peak & R. M.	Nevada	W. B. Ogden, 52 Wall	5,000,000			
Smith & Parmelee	Colorado	W. H. Hollister, 6 Broad	2,500,000	20 00	1 25	1 40
Social & Steptoe Con		T. H. O'Connor, 24 Nassau	450,000			
Standard Gold		C. B. Bostwick, 169 B'way	500,000			
Symonds Forks						75
Twin River Silver	Nevada	J. F. R. Hadden, 20 Nassau	800,000	100 00		
Texas Gold	Colorado		500,000	10 00		
Union Gold	Colorado	F. A. Potts, 110 B'way	1,200,000			
Wash. Mill & Silver	Nevada	W. W. Perkins, 71 B'way	300,000			
Wauba Yuma	Arizona	J. W. Silsby, 36 Pine	6,000,000			

COAL AND IRON COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Coal Co		M. A. Myers, 119 B'way	$1,500,000	$25 00		
Ashburton Coal Co		J. T. Rollins, 41 Pine	2,500,000			
Block House Coal		D. B. Keeler, Jr., 43 Pine	1,000,000			
Brewster Iron		H. Robison, 165 B'way	150,000			
Broad Top Coal & Iron Co	Pennsylvania	B. Love	2,000,000			
Cameron Coal Co		J. A. Simpson, 40 B'way	2,500,000			
Carbon Hill Coal Co		J. Silsby, 36 Pine	1,000,000			
Central Coal		F. P. White, 111 B'way	2,000,000	100 00		
Clifton Iron Co		P. H. Riordan, 34 Pine	1,250,000			
Columbia Iron		E. D. Webb, 77 Cedar	1,000,000			
Consolidation Coal	Maryland	J. S. Mackie, 71 B'way	5,000,000			
Crawford Coal		E. Clapp, Prest, 137 B'way	1,000,000			
Cumberland C. & I. Co		E. Kiscan, 90 B'way	5,000,000			31½
Derby Coal Co		W. S. Davison, 11 Broad				
Dover Coal and Iron Co		L. Chase, 88 Wall				
Del. & Hudson Canal Co		R. H. Nerderpol, 7 Nassau	15,000,000	100 00	160	
Ebervale Coal		G.L.Stout, Treas. 111 Br'y	500,000			
Fall River Bituminous		D. T. Blauvelt, 43 Pine	1,000,000			
Farrar Coal		C. H. Jones, 43 Pine	250,000			
Fisher Iron Co		M. Ellis, 19 William	100,000			
Hamp're & Balt. Coal		S. M. Pond, 70 B'way	500,000			
Iron Cliffs Co		C. J. Canda, 52 Wall	1,000,000			
Jackson Iron		G. P. Loyd, 119 B'way	300,000			
Kemble Coal & I. Co		R. A. Wight, 26 Ex. Place	300,000			
Keokuk Coal		J. F. Franklin, 112 B'way	100,000			
Lackawanna I. & C	Pennsylvania	E. C. Lynde, 52 Wall	1,200,000			
Lewis Run C. & I. Co		C. A. Sanborn, 80 B'way	750,000			
Lykens Val. Coal Co		F. A. Platt, 13 William	800,000			
McKean Co. Bit. Coal Co		J. H. Rolston, 80 B'way	1,500,000			
Lehigh & Susquehanna		E. W. Cark, Philadelphia, Pa.			1 00	
Mahanoy			400,000	100 00		
McNeal C. & I. Co		C. C. Godwin, 71 B'way	500,000			
Mount Riga Iron		G. M. Newton, 42 Cedar	300,000			
New Boston Coal		C. H. Ogden, 55 B'way	2,000,000			
N. Y. Con. C. & I. Co		A. T. Levine, 16 Wall				
N. Y. & Lehigh Coal		T. Simpson, 111 B'way	150,000			
Pacific Coal Co		G. Wrighton, 34 Wall				
Peekskill Iron Co		W. Murdock, 7 Nassau				
Pennsylvania Coal Co		E. H. Mead, 111 B'way	3,200,000	50 00		
Richmond Iron Co		C. H. Smith, 165 B'way	1,000,000			
Scotia Coal Co		T. N. Soper, 42 B'way	2,500,000			
Spring Mt. Coal		C. Runyon, 111 B'way	1,250,000			
Springfield & D'p Run C.		E. D. Webb, 77 Cedar	600,000			
Stout Coal Co		G. S. Comstock, 111 B'way	500,000			
Susquehanna & Wyoming		E. Potter, 40 B'way	1,000,000			
Tannerdale Coal		T. T. Ludlaw, 71 B'way	250,000			
Wash. Mutual Coal		M. C. Baker, 117 B'way	420,000			
West Point Iron Co		R. C. Brock, 110 B'way	500,000			
Wilkesbarre C. & I. Co		W. H. Tillinghast, 80 Br'y	3,400,000			
Wyoming Val. Coal Co		E. Potter, 40 B'way	1,000,000			

COPPER AND LEAD COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED
Anita Copper	California	J. A. Ferguson, 8 Wall				
Corinth Copper	Corinth, Vermont	S. H. Howard, 191 B'way	$500,000	25 00		
Davidson Copper						
Eagle Harbor Copper	Michigan	W. H. Smith, 43 Ex. Place	500,000	25 00		
Evergreen Bluff Copper	Michigan	W. P. Caper, 44 Ex. Place	500,000	25 00		
Globe Copper		R. K. Rickard, 19 Nassau	200,000			
Grand Portage Copper Co		A. S. Kellogg, 22 Pine	500,000			
Guymard Lead		Samuel Vernor, 38 Pine				
Hilton Copper		W. H. Smith, 43 Ex. Place	500,000			
Hope Copper		J. W. Davis, 19 Nassau	500,000			
Hudson River Copper	New York	T. Clarkson, 22 William	1,500,000			
Indiana Copper Co		J. M. Mills, 25 Nassau	500,000			
Isle Royale Copper	Michigan	F. W. Caper, 44 Ex. Place	1,000,000			
Keweenaw Copper	Michigan	F. W. Caper, 44 Ex. Place	500,000			
Lake Superi'r Silver Lead	Michigan	A. S. Kellogg, 22 Pine	1,000,000			
Omiga Copper	Michigan	S. Cooper, 7 Pine	500,000			
Ridge Copper	Michigan	J. L. Gardiner, Jr., 43 Ex. P.	500,000			
Rockland Copper	Michigan	A. Fullerton, 71 B'way	500,000			
St. Joseph Lead	Michigan	J. W. Jones, 6 Broad st,	1,000,000			
St. Marguret Copper		E. P. Sutton, 43 Pine	250,000			
Schoolcraft Copper		R. Walsh, 22 William	500,000			
Superior Copper	Michigan	A. Fullerton, 71 B'way	500,000			
Union Copper		A. S. Kellogg, 22 Pine	500,000			
Vermont Copper	Vermont	J. C. Fly, 191 B'way	500,000			
Wallkill Lead, asst		S. M. Pond, 70 B'way			05	10

MISCELLANEOUS.	SITUATION MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Zinc Co		W. E. Lawton, 19 Cliff	$1,000,000			
Bigelow Blue Stone Co		H. Bogardus, 14 Pine				
Quicksilver					9½	9¾
Covill B. L. M. & M'f. Co		C. R. Bostwick, 302 Pearl	250,000			
Manhattan Marble		H. K. Gates, 70 B'way	300,000			
N. Jersey Zinc Co	New Jersey	A. H. Farlin, 61 Maiden L'e	1,500,000			

Editorial Correspondence.

SCIENTIFIC AFFAIRS AT THE CAPITAL.

WASHINGTON, April 25, 1870.

ONE'S first impressions of the Capital are likely to be quite distorted and unjust. It is true that an honest, as well as cultivated, mind heartily admires the beauty of the public buildings, and of many of the works of art contained in them. But the newspaper correspondents have made it the mode to sneer at these things; and the average visitor is likely to feel it his duty to depreciate them also. In the same way, the society of Washington is decried by those who dip into it for a hasty splash, and, flying away again, call it a puddle. But after a longer residence, the candid observer confesses that the sights of Washington are worth seeing, and its people worth knowing.

In like manner, few would suspect the extent of scientific work and the amount of scientific society to be found in this city. The Smithsonian Institution is a quiet, patient, careful, and influential agent for good, and it forms the gathering-point for a large circle of industrious and intelligent investigators and experimenters. Every year, some member of Congress or caustic correspondent, who cannot appreciate its nature and sphere, and who is in immediate need of a theme for a safe but severe speech or article, "pitches into" the Institution; but in the Old World, and among truly scientific men at home, its activity and importance are more intelligently recognized. Besides the attachés of the Smithsonian, there are numerous scientific men employed in the various Executive Departments. Many of these were invited to read papers before the National Academy of Sciences at its recent session; and their contributions added greatly to the interest of its proceedings. It is sufficient to name Dr. WOODWARD, the micro-photographer; Dr. OTIS, the comparative anatomist; Mr. GILL, Mr. NICHOLSON, and others.

The small but delightful social scientific club of Washington includes many eminent names. Generals SHERMAN, MEIGS, and HUMPHREYS; Professors HENRY, HILGARD, and SCHAEFER, Messrs. MCCULLOCH, Chief Justice CHASE, TAYLOR, PEALE, CRAIG, etc., are among the number. They meet every Saturday night at the residence of some member, and combine, with an informal lecture or paper and discussion upon some selected topic, a great deal of keen, pleasant, and discursive conversation. These weekly reunions are long remembered by those who have the good fortune to attend them.

CLARENCE KING and his party are here, preparing the volumes of their report for the press. It will be a good while yet before the whole of it will appear. One or two volumes, however, will be out this summer. From some knowledge of the character and execution of this publication, kindly afforded me by the courtesy of Messrs. KING and HAGUE, I can confidently say that its appearance will be such as to vindicate the delay and expense attending its preparation. Mr. KING'S facilities have been such as no other explorer in this country has enjoyed—both as to field-work and as to publication. His results will, no doubt, be strictly judged. Less than careful criticism he neither expects nor desires. There is everything in the men, their material, and their method, to warrant me in saying that this ordeal need not be feared.

Dr. HAYDEN is also here, and it is understood that the House Committee on Appropriations has decided favorably on the proposed appropriation of $15,000 for the continuance of his surveys in New Mexico, etc. The same Committee is expected to report an appropriation of $10,000 for mining statistics. This is a small sum, but a good deal of work may be done with it, by appealing, as the Commissioner of Mining Statistics has hitherto done, to the generosity and public spirit of the citizens of the mining States and Territories. R. W. R.

New Publications.

REPORT OF THE CENTRAL MINING COMPANY FOR THE YEAR 1869.

THE yearly report of another of the prosperous copper mining companies of Lake Superior (the number of which, by the way, has been anything but large during the last few years) is before us to-day. We note with great pleasure that the mine of the Central Mining Company has fully kept up its reputation, and promises to do so for the coming year. This mine has, from the beginning of operations, kept up a steady and highly satisfactory yield, and may in this respect be justly called the best copper mine on Lake Superior, and perhaps in the country.

The pamphlet before us contains the Directors', Agent's, and Mining Captain's reports, and is a short but perfectly clear and convincing document. The business done during the year, and the financial condition of the company on the 4th of April, 1870, are best illustrated by the following from the Directors' report:

"The amount of copper produced in 1869 was 1,117 1455-2000 tons mineral of 78½ per cent. against 1077 859-2000 tons of 80¾ per cent. in 1868; the gain in 1869 being only equivalent to 14,784 pounds of ingot copper.

"The shipments from the mine were 1,151 911-2000 tons mineral, yielding when smelted 78½ per cent., or 903 1801-2000 tons refined copper, which has been sold at an average price of 22 39-100 cents per pound; a decline of 1 61-100 cents per pound from the average price obtained in 1868.

"The following figures show the result of the year's operations:

RECEIPTS.		
Sales of copper		$404,796 44
Sales of silver		1,142 78
Interest account		5,159 49
		$411,098 71
EXPENDITURE.		
General expenditure as per balance sheet	$298,835 08	
ADD		
Decrease of available effects at mine during year as per inventories	11,911 64	
Making the total cost for 1869		310,746 72
And showing a net profit of		$100,351 99
The surplus available assets of 1868, after payment of dividend of $70,000 were	$145,786 26	
DEDUCT		
For increase of amount invested in new materials over last year	4,129 84	141,656 42
Making the net available assets, Dec. 31st, 1869		$242,008 41

"A dividend of $4 per share ($80,000) out of the earnings of the year was paid to stockholders March 10th, 1870, leaving a reserve for future contingencies."

From the agent's report we learn the following in regard to the operations at the mine during 1869: Amount of sinking performed, 342 11-12 feet, at an average cost of $34 per foot; total of drifting, 2,253 2-12 feet; average cost, $11.08 per foot; total amount of stoping 3,150 25-36 superficial fathoms, at $17.80 per fathom, and 148 158-216 cubic fathoms at $25.24 on an average. The total depth of the company's four vertical shafts, and the incline now sinking, is given as 3,127 1-12 feet; the deepest vertical shaft (No. 4) is 909 7-12 feet, and the incline has reached a depth of 721 feet. To expedite the sinking of the latter, three Burleigh rock drills, with machinery for compressing air, pipes, etc., have been bought. No 2 shaft (881 4-12 feet) has reached the 110 fathom, and No. 4 the 100 fathom level. The incline has been sunk 175 feet deeper during the year.

The total length of levels is 18,872 6-12 feet; total ground opened on the vein for stoping, January 1st, 1870, 15,604 fathoms. Stoped out since January 1st, 1869, 3,152 fathoms; and opened since then, 4,404 fathoms. The total product of the mine during the year was—697 masses, 1 257,299 lbs; 19 hhds. kiln copper, 44,087 lbs; 802 bbls. stamp copper, 934,069 lbs.—total, 2,235,455 lbs., or 1,117 1455-2000 tons. Average yield of mineral per fathom of ground broken, 576 lbs.; yield of ingot copper per fathom of ground broken, 452 lbs.

The total amount of rock stamped at the company's mill was 17,688 tons, which yielded 2.63 per cent. of copper. The total expenses of stamping and washing were $15,314.71. The following interesting information is given in this connection:—Tons of rock stamped per cord of wood consumed, 10 47-100; tons of rock stamped per head in twenty-four hours running time, 4 39-100; total running time of 32 heads, 125 days, 18 hours, 52½ minutes; total cost of stamping and washing, 86 56-100 cents per ton. The cost of labor for breaking rock and tramming same to stamps was $2,944.62, or 16 54-100 cents per ton.

The average number of miners employed is reported at 216, at a cost of $54.85 per month to the hand; average number of surface men, 36, at $46.47 per month; and average number of stamp men, 14, at $45.38. At present, 287 men are in the employ of the company, including officers and clerks.

The establishment of schools at the mine is highly creditable to the company, and both schools and church are reported to be in a flourishing condition.

The captain's report contains the information above given in more detailed form, and is, like the two foregoing, a brief but clear statement. A comprehensive insight into the work performed, and its cost, is facilitated by well-arranged and concise tables. In conclusion, the captain informs the company that the prospect of the mine for the coming year is very favorable.

The Geological Survey of Ohio.

WE have received a copy of the address of Professor J. S. NEWBERRY, Chief Geologist of the Ohio Survey, delivered before the legislature of that State in February last, and reporting the progress of the survey during 1869, the first year of its reorganization. This paper is marked with the usual clearness of statement and practical good sense peculiar to its distinguished author. A perusal of it is sufficient to convince us that the Ohio survey has accomplished in its opening season more than the usual results at that stage of such undertakings. Professor NEWBERRY says that a general investigation of the geological structure of the State; careful studies of the relative position, age, thickness and lithological character of each formation; the discovery of several groups not heretofore known to exist in the State; the demarcation of the respective areas of exposure; and the preparation from these data of a new, original and geological map of Ohio, more minute and accurate than any that have preceded it, are among the fruits already available. Moreover, tangible progress has been made in the economical geology. Analyses of coals, iron-ores, clays and limestones, and examinations of these substances and their localities with reference to profitable industries based upon them, have been entered upon, and, to a large extent, completed. A fine State cabinet has been collected, numerous fossils discovered, compared, described and illustrated, and a volume of five hundred pages octavo, containing the record of all these and of other matters, awaits publication as the first report.

Professor NEWBERRY closes his address with the following excellent remarks, which are better than a peroration:

"Should the Geological Survey be continued under its present management, the investigations, now begun, will be extended until they shall have covered all our area, and have embraced the agricultural capabilities, the geological structure in all its details, and all the mineral staples, determining their quality, quantity, distribution and adaptation. It is also hoped that, without any considerable expense to the State, experts in these departments shall give us fuller information than is now possessed by our people in regard to our plants and animals. My judgment is that all this information should be made as concise and practical as possible; should be published in volumes of modest dimensions and moderate cost, so as to be brought within the reach of all those who can make intelligent use of them; that they should be made of such a character as to be of real utility to our people, and not of equal value to residents in other countries, as to those who pay for them. My idea of a geological report is, that it should be an embodiment of all the important facts in natural or applied science that immediately concern the inhabitants of the area it covers, so that it may be a book of constant reference to the manufacturer, the mechanic, the architect, the farmer, the teacher, the parent; one that may always be at hand to answer any question that may be asked in regard to geological structure, economic minerals, fossils, plants or animals. The investigations necessary to prepare such a report will require time and money, but all the nations of the Old World and most of our sister States have expended sums for such purposes, which if well-directed would more than serve our purpose. I can hardly think that Ohio, third in the Union, as she is, in wealth and population, and so rich in undeveloped resources, will rest satisfied with anything short of a full and thorough exposition of her gifts; and such an one, in fact, as her pride and interest alike dictate."

Perhaps Professor NEWBERRY goes too far in claiming as the sphere of a geological report "*all the important facts in natural and applied science* that immediately concern the inhabitants," etc. Yet if he does err, it is an error far more tolerable than the opposite one, of confirming the limit of such a work to descriptive or systematic—i. e., theoretic, science, and ignoring the practical necessities of the people and the present.

Glaukopyrite, a New Mineral.

THE following abstract of a publication by F. SANDBERGER, is taken from "Verhandlungen der K. K. Geologischen Reichsanstalt."

In pieces of coarsely lamellar calc-spar, brought by Dr. SCHIERENBERG from the mines of Guadalcanal, Andalusia, different ores were observed, the examination of which was undertaken by Prof. SANDBERGER. This resulted in the proof of the existence of a new mineral which occurred, together with solid, crystallized fahlore, proustite and scattered bunches of Iamesonite, the new mineral greatly predominating in quantity. It appears in kidney-shaped aggregations, composed of extremely thin shells of finely-granular structure, which repeatedly alternate with thin layers of calcspar and rarely with those of proustite. The kidney-shaped masses are entirely surrounded with lamellar calcspar, and if this is removed with acetic or dilute muriatic acid, the surface appears to be formed by numerous, mostly very small, crystals in comb-like aggregations. On the layer of these crystals SANDBERGER could discern with a magnifying glass, as a fundamental type, twins of two flat rhombic tables, lying crosswise to each other, and presenting the habitus of cerussite—twins of similar combination; besides these, triplets can be distinctly recognized. The streak of the fine granular masses, is shining, but the lustre of the crystal faces is feeble, except certain faces, supposed to be normal prismatic and brachy diagonal prismatic, which have a strong metallic lustre. The color of the mineral is light lead-gray to tin-white, the streak grayish-black; hardness, 4.5; sp. gravity, 7.181. In contact with the air, the mineral tarnishes slowly, first assuming a blackish, afterwards a yellowish-brown, and finally a blue color. An analysis made by R. SENFTER in the laboratory of Dr. PETERSEN, gave the following result:

Sulphur	2.36
Arsenic	66.90
Antimony	3.59
Iron	21.38
Kobalt	4.67
Copper	1.14
	100.04

The new ore belongs consequently to the group of arsenical pyrites, and comes nearest to the mineral from Wolfach, which SANDBERGER identified with BREITHAUPT'S geyerite.

But as neither form nor hardness, nor specific gravity and color are the same in both, and as, moreover, the copper observed in the new mineral is wanting in geyerite, SANDBERGER proposes for this new ore from Guadalcanal the name *glaukopyrite*, and gives for its composition the formula

$$Fe\,S^2 + 12\left(\begin{matrix}Fe\\(Co)\\(Co)\end{matrix}\right)\left\{\begin{matrix}As^2\\(Si^2)\end{matrix}\right.$$

Mines and Mining Machinery on the Pacific.

THE San Francisco *Bulletin* makes the following cheering report:

"A remarkable activity in mining operations on this coast is noticed as the spring advances, and encouraging news from both quartz and placer districts arrive daily. Aside from the new, and hitherto almost unknown mining regions, discovered in California, Nevada, Montana and Colorado, which are rapidly coming into prominence, we hear of the resumption of work upon mines abandoned years ago. The facilities for extracting and shipping ore will now warrant the investment of capital in mines where ten years ago it would have proved a clear loss. The effect of the railroad is becoming more clearly understood, and the fact has been demonstrated to the satisfaction of practical miners that better, and, taking all things into consideration, cheaper machinery can be purchased in San Francisco than across the continent. Mining machinery was ordered from Chicago by a few Nevada miners, but the experiment proved unsatisfactory in the end.

"A reduction of railroad charges upon a certain class of freight promises to be of material assistance in the development of mines in adjoining States and Territories. In the crushing and sampling works of Howland & Co., are 2,500 sacks of ore from a mine near Salt Lake, averaging 40 to 50 per cent. lead and $200 in silver per ton. Also, a quantity of silver ore from Hamilton, Nev., and copper ore from the Confidence mine, Battle Mountain, Nev. Within the past few days, a considerable amount of galena has been sold on sample and shipped to Liverpool; and the business of selling by sample is constantly increasing. If the railroad company adheres to its promise to reduce the price for transporting low grade ore, as it undoubtedly will, additional stimulus will be given to mining operations. The foundries have considerable work on hand at present in the shape of mining machinery. The Union has just completed 150 tons of machinery for the Meadow Mining Company, in the shape of a fine 20-stamp mill of the Scott & Nichols pattern. It also has work on hand for the Mariposa mill, Washoe Pioneer mill, Unionville, Nev., and French mill, Silver City, Nev. The Pacific Foundry is at work on a number of small orders, and has two of Wilson's patent steam stamp mills in process of construction. One of these mills is on exhibition in the yard, and attracting the attention of practical miners and millmen who are delighted with its simplicity and strength."

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor.

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THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.*

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The Importance of Mining Records.

IT is disheartening to observe with what mingled ignorance and disdain the subject of accurate accounts and records is treated by the majority of mine-owners and superintendents. The great importance of such records is beyond all doubt; and in the hope of arousing some minds to it, we shall enumerate a few of its many bearings.

1. It is essential to the conduct of any business that a thorough system of book-keeping should be maintained. Most managers of mines do not even know whether they are making or losing money, unless the profit or the loss be very great. Frequently their reports and half-calculations indicate a profitable business, while, to their great perplexity, the bank-account gives to this pleasing conclusion a grim contradiction. Others keep accounts sufficiently accurate to show them at any time their financial condition, but their accounts are not classified; and they have no exact means of knowing whether in some particular department there is waste or bad management. A few, who are famous as good managers, have the faculty of keeping classified accounts in their heads for a considerable period. They carry on business very much as most ladies keep house, judging by an instinct born of habit, about how large each item of expense ought to be. It should not be necessary to argue to intelligent men that this sort of slip-shod administration, without checks or balances, is neither business-like nor safe. The superintendent himself, if his honesty is once suspected, whether with or without reason, is utterly defenceless. No position can be more humiliating to a sensitive man than that in which he is obliged to say to his employers, "It is true that I have no evidence to prove that I have wisely and honorably discharged my trust; there is no record of my administration which any other man can understand; I must appeal from appearances to your personal confidence in me."

2. No mine can be carried on with the best economy unless accurate maps and records of the workings are kept. The mining captain, or the underground foreman, or some common receiver, who has been employed since the commencement of operations, frequently has a vague recollection of rich ore here or poor ore there, or a cross-vein, or a feeder, or a slide, or what not, at some other point, long since, perhaps, inaccessible by reason of the collapse of the stopes or galleries; and on this indefinite sort of knowledge the plan of working is based. More frequently, however, there is no plan. A chimney or body of ore having been discovered, is worked until exhausted; and then there is nothing to serve as a guide for further exploration. In cases where the history of the underground work is confined to the memory of some one man, this man is too valuable to be discharged, and too likely to presume upon his position. Because work cannot be intelligently continued without him, he demands higher pay, or neglects his duties, or tyrannizes over the superintendent or the company to which he is indispensable.

3. Accurate statistics, such as classified accounts and well-kept maps and records furnish, are demanded by capital. In many cases, shrewd and cautious men refuse to invest money in mines which have been under development for a considerable time, and yet cannot produce complete records of their past history. No matter how promising may be the appearance of the bottom of each shaft or the end of each tunnel, experience tells us that these favorable signs are often the signals to the proprietor of "a good chance to sell out;" and if we would judge safely, we should know how great has been the proportion of ore to excavation, what has been the current average yield per fathom, and what has been the usual distribution of the paying ground, and the dimensions of the vein, in all the portions worked. Foreign capitalists especially are accustomed to have these questions answered. In most reports made by foreign engineers on our mines, it is attempted to answer them; and the results are ludicrous, because the sources of information are so meagre, and because the labor-saving ingenuity of our citizens too often replies to such queries with a guess or a fib. We have been informed, for instance, over and over again, that the proportion of first-class ore in a certain district (which we will not name) was one-tenth of the whole quantity of ore extracted We think the persons making the estimate were honestly guessing at what it was their business to know exactly. Yet a laborious compilation of actual results from all the mills and furnaces showed this proportion to be, in the most favorable cases, one in fifty, and generally, perhaps, one in sixty or seventy. How can men carry on their own business, and how can they convince others of its sound and profitable nature, if, with regard to vitally important facts, they do not care enough to know, nor know enough to guess?

4. A few mines in this country present refreshing exceptions to this general neglect. Some of the copper mines at Lake Superior, for instance, and some of the mines on the Comstock, have been managed with great exactness and fidelity, and their records present the most trustworthy and instructive statistics of American mining which it is possible to obtain. It is too much to ask that every small mine shall support a skilled book-keeper, and maintain the elaborate system of accounts illustrated by these examples. Many agents and superintendents, we are persuaded, if they were only shown how to do it, would be able to do this duty for themselves.

One of the most important branches taught in foreign schools of mines is the system of keeping accounts and records adapted to this industry. This, we are sorry to say, is neglected at our American schools, and it is one of those things which are not generally picked up in practice. We think instruction on this point would be highly valuable, going to the root of a great part of the trouble and disaster experienced in mining operations. Moreover, a book is needed which shall give simple and easily followed directions on the subject to practical miners and superintendents. Such a book should show how the distinction is made between the construction account and the running expense, and how each is classified; between labor and materials, and how each is classified; and it should give specimen blanks on three different scales, ranging from the smallest and most simple operations to the most extensive and complicated, and so arranged that the items enumerated in the most complete blanks shall be covered in less detail by the less numerous columns of the simpler forms. Where book-keepers are not employed, the latter could be used. There should also be convenient forms for registering the progress of underground work and the daily experience of the mine; the amount and character of material extracted, and the amount of labor and material expended. These blanks could be manufactured in large quantities by stationers, and sold in book form or in sheets to those requiring them. Why cannot some skillful and experienced man, like Mr. J. H. LUDLOW, the accomplished book-keeper of the Savage mine at Virginia City, prepare such a manual? We think it would be easy and profitable; and we feel sure it would be greatly beneficial to the community.

Hydrogenium-Amalgam.

AT a meeting of the New York Lyceum of Natural History, April 11th, a paper was read by Mr. OSCAR LOEW, chemical assistant in the college of New York, which is of the highest importance, as it corroborates entirely the discovery of Professor GRAHAM. This illustrious chemist found that the combination of hydrogenium with palladium presented all the marked characteristics of an alloy. Mr. LOEW found, in the same manner, that the combination of hydrogenium with mercury has a metallic appearance. The experiments of both these gentlemen leave hardly any doubt that common hydrogen is only an originally metallic substance in a gaseous state, the same as mercury-vapors, which show no characteristics of a metal as long as they are gaseous. According to Dr. GALLATIN, Professor GRAHAM tried for a long time, to produce an amalgam of hydrogenium *by means of the electric current*, but in vain.

By the courtesy of the author we are enabled to publish the outlines of his discovery, as he presented them to the Lyceum of Natural History:

"When zinc-amalgam is shaken with water a slow decomposition of the latter takes place, which can be recognized by the formation of flocculi of hydrated oxide of zinc, and by small bubbles of hydrogen which escape, after the mixture stands for a time.

"The decomposition of water by zinc is intensified when a small amount of bichloride of platinum is added, in which case a spongy body is formed on the surface of the zinc-amalgam. This body I have found to be an alloy of hydrogenium and mercury. Hydrochloric acid does not act in a way similar to bichloride of platinum.

"To obtain the hydrogenium amalgam on a larger scale, you shake thoroughly, with refrigeration, a zinc-amalgam containing one to three per cent. of zinc with a solution of bichloride of platinum, containing about ten per cent. of the latter. After the mixture has been well shaken, it is thrown into moderately diluted hydrochloric acid, when the excess of zinc as well as the oxyd and oxychloride of zinc will be dissolved, and a mixture of mercury and hydrogenium-amalgam will be obtained which can be easily separated mechanically. Without the treatment with hydrochloric acid, the product will be soon decomposed, with great expansion and evolution of hydrogen gas.

"The body thus obtained has the consistency and appearance of the ammonium-amalgam, and slowly develops hydrogen under water, as well as in the dry state; by which decomposition the volume will be found to have considerably increased. On heating it in a vessel containing air, it swells up and water is directly formed, the hydrogenium combining directly with the oxygen of the air. The marked reducing power of hydrogenium found by GRAHAM in the palladium-hydrogen alloy may be observed here also. Ferridcyanide becomes ferrocyanide; perchloride of iron becomes protochloride. It has been a supposition of several chemists that the so-called ammonium-amalgam may be hydrogen-amalgam mixed with absorbed ammonia, and I found, indeed, that ammonia is taken up by hydrogenium-amalgam to a certain extent; but the behaviour towards acids, and the investigations of LANDOLT and of our American chemist, Dr. GALLATIN, have shown the existence of true ammonium-amalgam; so that these bodies are certainly not identical.

"Under certain conditions the hydrogenium in its amalgam takes up rapidly the oxygen from the air, the temperature rising considerably, while water is formed. If you shake zinc-amalgam of four to five per cent. zinc (previously warmed, to liquefy the crystallized portion), with an equal bulk of bichloride of platinum solution, of 10 per cent., keeping well-cooled while shaking, then expose to the air, after pressing gently between sheets of filter paper in a layer not too thin, the said phenomenon will appear after a few minutes. Here it is the finely divided platinum which condenses the oxygen and makes it act upon the hydrogenium in the amalgam.

"The platinum, after perfect amalgamation, does not act so energetically as in the nascent state. When platinum-amalgam is shaken with zinc-amalgam and water, the decomposition of water by the zinc is extremely slow, and the hydrogenium-amalgam will not be observed for some time.

"Under certain conditions the hydrogenium-amalgam is formed without the aid of chloride of platinum. As I once had about twenty pounds of mercury containing some zinc, standing in a bottle with water for three weeks, the hydrogenium-amalgam was formed on the surface of the mercury, renewing itself from below, and decomposing above.

GRAHAM compares hydrogenium with the active modification of oxygen (ozone), and indeed there is much analogy. We can also accept three modifications of hydrogen, namely, the nascent hydrogen, common hydrogen, and hydrogenium. The nascent hydrogen obtained from sodium-amalgam and water, or by zinc and HCl, or by the electric current, does not combine with mercury; therefore a distinction appears proper between common nascent hydrogen and hydrogenium, which may be thus illustrated:

Antozone.	Oxygen.	Ozone.
O	[OO]	[(OO)O]
Nascent Hydrogen	Common Gaseous Hy'gen	Hydrogenium
(*Alpha.*) *Hydrogen.*	(*Beta.*) *Hydrogen.*	(*Gamma*) *Hydrogen*
H	[HH]	[(HH)H]"

A Little Behind the Age.

A COTEMPORARY gives an interesting account of the manner in which old greenbacks are economically worked up into envelopes for the use of the Treasury Department. This was tried under Mr. MCCULLOCH, but discarded even before he ceased to be Secretary. The fragments of currency thus utilized could not be allowed to go outside of the Treasury building, since it is incumbent upon the Treasurer to make sure of their destruction. They were therefore reduced to pulp in a room in the basement of the building; and the chemicals employed, together with the pulp itself, diffused a nauseous odor through the stories above. Besides this, it is said that the cost of the process, including the necessary guards and checks, to prevent the abstraction of any portion of the mutilated currency, was fully equal to the price of envelopes purchased outside, while the manufactured envelopes, though tough, were not particularly good-looking. In a word, the experiment proved a nuisance and no saving; and was therefore abandoned long ago.

Action of Ammoniacal Salts upon Oxide of Copper.

WHEN finely-powdered black oxide of copper, obtained by the ignition of nitrate of copper, is boiled with a solution of chloride of ammonium for a length of time, the oxide loses its color and becomes greenish; when, after continued boiling, the mixture is evaporated to dryness, and next exhausted with water, a green powder and a bright blue-colored solution is obtained. This powder, after having been well washed and dried, first at the ordinary temperature of the air, and lastly in the air-bath at between 120° and 140°, yields, on analysis, for 100 parts: Water, 17.02; chlorine, 16.10; oxide of copper, 70.05. The substance is, therefore, almost exactly similar to the mineral known as atakamite, from Copiapo, Chili, which, according to Dr. RAMMELSBERG's analysis is $2(CuCl+3CuO)+9HO$; in 100 parts—Chlorine, 15.65; water, 17.88; oxide of copper, 70.00. When the oxide of copper is similarly treated with a solution of sulphate of ammonia, a salt is obtained consisting in 100 parts, of oxide of copper, 67.87; sulphuric acid, 18.73; water, 13.40. Or a substance very similar to the mineral brochantite, from Krisuwaga, Iceland, consisting, in 100 parts, of oxide of copper, 67.75; sulphuric acid, 18.88; water, 12.18. With a solution of carbonate of ammonia, which, by-the-bye, is itself decomposed by boiling, a substance was obtained containing, in 100 parts, carbonic acid, 19.02; oxide of copper, 70.24; water, 10.74. With nitrate of ammonia, a substance is obtained containing, in 100 parts, oxide of copper, 65.54 water, 18.94; nitric acid (N_2O_5), 15.52; or very nearly the substance, $2(CuONO_5)+15HO$.—*Chemical News.*

Pozzuolana.

Translated from Dr. W. Michælis "DIE HYDRAULISCHEN CEMENTE."

BY ADOLPH OTT.

VITRUVIUS relates (Lib. II., Cap. 6) that pozzuolana was found in the district between Cumae and the promontory of Minerva (between Bajæ and the Cape "della Campanella"), and though his views on the nature of this material are rather indefinite, its volcanic origin was well known to him.

The time in which the Romans became acquainted with the application of pozzuolana for hydraulic constructions cannot be determined with accuracy, but, since Marcus Portius Cato would certainly have mentioned it had it been known, the time of its first use for such purposes cannot well be dated back further than the second century of our era.

Pozzuolana, which has been for a long time the only, and is yet a very important material for the preparation of hydraulic mortars, is a volcanic tufa of a granular, somewhat porous texture, more or less solid, often pulverulent, little homogeneous, and of a gray or yellow to dark red-brown color.

The mass is magnetic, loses its water readily in heating, and may, under ordinary pressure, be almost completely decomposed by sulphuric acid, and even by strong muriatic acid.

As volcanic tufa is a detritus or conglomerate formation, chemical analysis must necessarily lead to somewhat variable results. This cannot appear strange, since conglomerates are very heterogeneous masses. But as analysis permits an excellent insight into the nature of this material, we append here first a series of analyses, reserving a special explanation, until the reader may have become acquainted with the general characters and the composition of some other materials nearly related to the pozzuolanas.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
Silica	44.5	42.22	46.5	46.01	44.5	59.144	59.814	51.616	52.80	54.57	54.41	56.31	45.50	51.18
Alumina	15.0	17.8	10.6	16.5	15.5	21.280	16.355	15.08	15.88	17.93	15.40	15.38	16.05	13.71
Oxide of Iron and Manganese	12.0	6.3	29.5	15.5	12.5	4.760	4.565	6.21	7.57	5.49	7.74	7.11	11.69	13.61
Lime	8.5	9.2	10.0	10.0	9.5	1.000	1.585	5.43	3.19	0.77	3.17	1.74	5.03	7.09
Magnesia	4.7	6.9	....	3.0	4.4	....	....	1.18	0.84	0.77	1.50	1.36	3.20	4.72
Potassa	1.4	2.6	....	....	....	4.572	14.158	6.19	7.66	5.23	7.54	6.54	4.12	2.94
Soda	4.1		....	....	....	7.280	1.278	1.01	2.10	6.40	2.57	4.84	2.28	2.94
Chlorine			....	....	....	1.553	1.972	0.278	0.15	....	0.27	0.40	0.40	....
Water	9.2	10.2	2.5	3.0	3.3	....	....	11.40	9.26	8.19	7.35	6.72	9.56	4.58
	1. Pozzuolana, from the quarries of St. Paul, near Rome (highly valued), according to ..... BERTHIER.													
	2. " from the surroundings of Naples, " ..... RIVOT.													
	3. " from Mount Vesuvius, brown, " ..... VICAT.													
	4. " " " dark-gray, " ..... VICAT.													
	5. " " " " " ..... VICAT.													
	6. " " " " " ..... ELSNER-STENGL.													
	7. " " " " " ..... ELSNER-REINHARDT.													
	8. " of Nola, " ..... ABICH.													
	9. " of Pausilipp; yellow, " ..... ABICH.													
	10. " Epomeo, " ..... ABICH.													
	11. " Pausilipp; white, " ..... ABICH.													
	12. " from the crater of Monte Nuovo, " ..... ABICH.													
	13. Tufa, from the island Vivara; yellow, " ..... ABICH.													
	14. " " " white, " ..... ABICH.													

Until late in the seventeenth century little more than had been treated of by the Roman authors was known about the preparation of mortar. In the fifteenth and sixteenth centuries, in the works of LEO BAPTISTA (de re ædificatoria), PALADIO SCAMOZZI, in Italy, and PHILIBERT DE LORME, in France, we find nothing but Vitruvius' statements. Until that time, pozzuolana was therefore the only material that served for the preparation of hydraulic mortars. The merit of first employing native substitutes for the Italian pozzuolanas belongs to the Dutch: they made use of the tufa from the vicinity of Coblenz, a material with which the Romans had already been acquainted. When they extended their dominion over Northern Germany, and established themselves on the Rhine, they discovered in the Eifel—a hearth of extinguished volcanic activity—a material closely resembling their native pozzuolana.

Whether they employed it instead of the latter for the grand hydraulic constructions upon the left bank of the Rhine is not certain, but there is no doubt that they quarried it. The condition in which these old mines are found confirms this fully. This tufa of the Eifel, called *Duckstein*, on the Rhine, is in part of a greater solidity than the Italian, and may therefore have served as a building stone only, for which purpose some varieties are extremely well adapted, since they are not only easily worked, but also possess an uncommon durability. In the middle ages this tufa was therefore very generally employed as a building material.

It is said that in 1682 a Dutchman by the name of VAN SANTEN, erected a mill upon the Rhine, in which this tufa was ground to a powder, and from this time dates its use as hydraulic mortar with some certainty. At first it was employed in Holland only, where hydraulic constructions always played an important part; but from here its employment was soon extended to France, Germany, Sweden, and other countries.

The Hollanders called the powdered tufa "tyrass," which means putty, or cement; from this the word "trass" originated, which in practice, as well as in science, has become perfectly naturalized.

According to another view, the word "trass" originates from terrace, because the tufa was cut out in the form of terraces, like the turf; yet this derivation is, however, not very probable. The trass which is made from tufa is of a gray, or bluish-gray, sometimes a yellowish-brown color, more or less dense, somewhat porous, granular, magnetic, sticking to the tongue, and has the distinct odor of clay. Like pozzuolana, it is mostly soluble in sulphuric acid and concentrated muriatic acid.

The chemical analyses of trass which are in our possession have been made by BERTHIER (1), ELSNER (2), RIVOT (3 and 4), VICAT (5), VOHL (6), and BLEY (7.) According to them, trass is composed of:

	1	2	3	4	5	6	7
Silica	57.0	48.94	57.5	54.9	46.45	53.07	54.902
Alumina	16.0	18.93	10.1	16.5	20.72	18.28	8.725
Oxide of Iron and Manganese	5.0	12.34	3.9	6.1	5.59	4.45	14.804
Lime	2.6	5.41	7.2	4.0	2.33	1.24	1.669
Magnesia	1.9	2.42	1.1	0.7	1.00	1.31	0.980
Potassa	7.0	0.37	6.4	1.0	15.55	4.17	9.412
Soda	1.0	3.56				3.73	
Water	9.6	7.65	—	—		12.70	9.510

Closely related to pozzuolana and trass is Santorin-earth. As indicated by the name, it occurs on the island of Santorin (Thera), the southernmost of that great group of islands in the Ægean Sea, called Cyclades, which are so renowned on account of the volcanic eruptions that have occurred there at all times, the last having taken place in 1866. Being a volcanic tufa like pozzuolana and trass, the Santorin-earth differs from them very little in its exterior appearance. It is, however, less dense and solid, and consequently easier pulverized. As to its chemical composition, it contains more silica, and cannot be decomposed as completely by acids. We possess only two analyses of this earth, of which one has been published by ELSNER (1), and the other by SCHULZE (2.)

	1.	2.
Silica	68.50	65.47
Alumina	13.31	16.45
Oxide of Iron	5.20	3.13
Lime	2.36	2.94
Magnesia	0.73	1.52
Potassa	3.13	4.34
Soda	4.71	1.33
Chloride of Sodium } Sulphate of Soda, }	0.31	3.59
Water	1.45	—

On the Manufacture of Vitriols.

By A. ÉILERS, Mining Engineer.

I.

THE term "Vitriols" comprises the soluble sulphates of all the metals. The most common, and at the same time the most prominent, are the sulphate of iron (copperas), the sulphate of copper (blue vitriol), and the sulphate of zinc (white vitriol). These three are very extensively used in the arts and manufactures; and they are therefore themselves made in large quantities, and by many different methods. The mode followed varies in different localities, according to the facilities presented for economical manufacture, and is, of course, the more appropriate, the cheaper, and at the same time purer, the article can be produced. The latter quality especially is at present very essential, while formerly vitriols were often made which varied in composition and the relative amounts of impurities with almost every campaign. The manufacture of one or more of these vitriols as products, *apparently* secondary in importance, is in many establishments *really* the only means of keeping the whole business in a paying and prosperous condition; and, considered in this light, it is, especially in the United States, of the utmost importance. This applies particularly to many mining and smelting establishments; and for the benefit of those who may profit from the perusal of this article, a description of the methods employed for the manufacture of these substances will be given in the following. To treat the subject fully and exhaustively, and in such a manner that even those who are not versed in chemistry and technology may become sufficiently acquainted with the details of the various operations, we will first describe the manufacture of each one of the three above-mentioned vitriols in a separate article, and, in conclusion, point out in which manner the manufacture of all three may, under certain circumstances, be profitably combined in the same run of operations.

GREEN VITRIOL OR COPPERAS.

This substance, the sulphate of protoxide of iron ($FeO,SO_3 + 7$ HO) is, when pure, composed of 25.9 parts of protoxide of iron, 28.8 parts of sulphuric acid, and 45.3 parts of water. One part of this vitriol is dissolved by 2 parts of water at O, by 1½ parts at 15, and by 0.27 parts at 90 degrees C. The common copperas of the market contains, however, besides the above constituents, small quantities of oxide of zinc, copper, aluminium, magnesium, potassium, etc., and always more or less peroxide of iron. These substances do not impair the value of the vitriol for some purposes, while for others they are highly injurious. The contents of copper, for instance, render copperas unfit to use for the manufacture of Prussian blue, while the presence of peroxide of iron is injurious in dyeing with indigo, but desirable in making ink, Prussian blue, and in coloring black by means of tannic acid.

The manufacture of vitriol on a large scale is conducted in various ways. If an entirely pure product is to be made, the best results are undoubtedly reached by dissolving iron in dilute sulphuric acid. This is either used right from the lead-chambers of sulphuric acid works, before it is concentrated, or after it has previously been used for the manufacture of ether, in petroleum refineries, etc. In the latter case it is diluted so as to show not above 1,159 specific gravity, then warmed in copper or lead vats, into which old iron is subsequently introduced. The acid is saturated, when the evolution of hydrogen-gas ceases. After this, the iron is left in contact with the solution for a short time, in order to precipitate foreign metals, like copper, etc., while the liquid is gently heated, until a sample, dropped on a piece of glass, shows, on cooling, a thin, crystalline skin. The solution is then drawn off, by means of a syphon, into a large reservoir, where it is carefully covered up and left to settle for eighteen to twenty-four hours. When all the suspended particles have sunk to the bottom, the clear solution is drawn off by syphons, and run into the crystallization vessels by means of lead-lined troughs. These vessels were used formerly in the shape of truncated cones, about three and a-half feet deep and seven feet in diameter; but lately the flat, rectangular vat, made of planks and lined with sheet-lead, is generally preferred. Across the tops of the vats slats are laid, which are perforated with many holes. At the expiration of a fortnight, and in cold weather before that time, the crystallization is completed, and the product is only washed with very little water (which is not permitted to run off, but used again in diluting sulphuric acid for another operation) and then dried on inclined shelves at ordinary temperature. On the proper execution of the washing and drying process depends mainly the appearance of the product. If the crystals have not been dried perfectly, they are inclined to become covered by a coating of yellowish-brown basic sulphate of peroxide of iron in a short time, while they keep their transparency and beautiful bluish-green color for months, if properly dried. As copper has, however, the property of taking up oxygen from the air eagerly, it will, sooner or later, change its color (and composition) unless the air is excluded. For large quantities this is, however, rarely done, as the newly-formed salt is not injurious in the most prominent applications of iron vitriol, and in some absolutely advantageous. To keep copperas unaltered for laboratory purposes, the bottle intended to hold it is generally, before filling it, washed out with ether, or the air is driven out by carbonic acid. When filled, it is tightly stoppered, and the cork covered with wax. It is, however, not alone the property of copperas to take up oxygen from the air, which acts injuriously, and has to be guarded against as much as possible. If, before drying, the mother-liquor has not been permitted to drain off a sufficient length of time (eight or ten days) on suitable shelving, some of the liquid, or, if evaporated, the salts contained in it, will remain in the angles between the different crystals. This makes the copperas totally unfit for transportation, because it attracts moisture from the air very rapidly, to such a degree as to liquefy the vitriol and allow it to run out of the barrels. Great loss is of course hereby occasioned.

In making the *pure* green vitriol, only those crystals are generally taken out of the vats and packed for shipment which have adhered to the cane, strips of lead, etc., as they are much the purest and largest, while the portions deposited along the sides and in the bottom are brought back into the dissolving vessels and crystallized over.

A very pure copperas is also made in some localities by dissolving spherosiderite (carbonate of iron) in diluted sulphuric acid; the proceedings in this method are essentially the same as those above described, the only difference being in the additional expense of the removal, from time to time, of the gangue from the dissolving vessels. The resulting copperas is not as pure an article as that made from metallic iron.

By far the largest quantities of copperas are made directly from the various sulphurets of iron, occurring mineralized in great masses in nature, and from mine-waters. In a subsequent article these methods, which are so important for many of our mines in the eastern and southern States, will be fully discussed.

Coals to Newcastle.

THE people of San Francisco, not content with the occasional earthquakes which add a zest to their daily life, have been manufacturing an earthquake under Blossom Rock, in their harbor. The explosion, however, according to a telegraphic account of the affair, though it made mincemeat of Blossom Rock, and threw the pieces, together with a huge column of water, a hundred feet into the air, was not felt at all in the city itself. A couple of small incidental earthquakes last week, which did shake the town, served to show that nature finds no trouble in outdoing our feeble gunpowder work. If the earthquakes could be relied upon to do custom-work, and to stop when it was done, they would be welcome visitors in places where large rocks are to be blasted and removed; but they perversely rattle down the towns, and leave man to blow up the Blossom Rocks.

In another part of this number will be found a full report of this latest triumph of engineering skill.

Destruction of Fish.

UNDER this heading the San Francisco *Morning Call* has the following sensible article upon the wholesale destruction of fish by the use of giant powder: "It is stated that certain brutes, in human form, are practising the abominable business of destroying fish by the use of giant powder. This is like killing the goose that lays the golden egg. It is worse. It is cruel without being sport. And now that the Legislature has passed an Act for the protection of fish, we hope that some examples will be made of persons who are so unprincipled as to destroy by thousands, for the poor compensation of obtaining a few fish, the cheapest, most palatable and healthful of all kinds of food. In some other parts of the Union, people and Legislatures have awakened to the necessity of cultivating fish in rivers and streams whence they have been driven, or in which they have been wantonly destroyed. We shall have to do the same in California, unless the fish-slaughtering business be put an end to."

Pyrometers.

A TRUSTWORTHY means of determining with accuracy the high temperature of furnaces, or any elevated temperature exceeding that of boiling mercury, has not as yet, perhaps, been successfully secured. The earliest pyrometer which actually came into use was that of WEDGEWOOD, invented about 1780. The principle upon which this invention was founded is the well-known property of clay to contract under the action of heat. In form, the pyrometer of WEDGEWOOD was extremely simple. It consisted merely of a guage, for measuring the dimensions of certain little clay cylinders before and after their subjection to the heat of the furnace. The test was in itself a very rude one, but the uncertainty of the indications of the instrument was increased by the fact, subsequently discovered, that clay may contract under the influence of a comparatively low temperature, long continued, to as great a degree as under a higher or less duration.

It was proposed, at about the same time with the origination of WEDGEWOOD's invention, to construct a thermometer for high temperatures on the plan of the mercurial thermometer, employing a fusible alloy instead of mercury, and a tube of clay enamel, or translucent porcelain, instead of glass. This was the conception of Achard, and it has a *prima facie* plausibility in its favor; but it is not known to have been reduced to practice. In fact, considering the liability of the porcelain to contract in the furnace—the property from which the pyrometer of WEDGEWOOD derives all that it has of practical utility—the indications of the high-temperature thermometer here proposed would be liable to uncertainty in a very high degree. Several very distinguished physicists have endeavored to reach a more satisfactory solution of this difficult practical problem, by availing themselves of the expansibility of air under high temperatures. These efforts have been, to a certain degree, successful; but the methods to which they have conducted depend for their accuracy upon the truth of the assumption, not yet fully established, that the expansibility of gases at the highest artificial temperatures follows the same law as at those at which this law has been experimentally verified.

One of the most promising methods of pyrometric measurement which has yet been proposed, is the suggestion of Professor EDMOND BECQUEREL, of Geneva, and is founded on the principles of thermo-electricity. In the Exposition of 1867, Mr. RUHMKORFF, of Paris, exhibited a thermo-electric pyrometer constructed under the direction of Professor BECQUEREL, which, in the experimental trials to which it has been subjected, has furnished indications remarkably consistent with each other; while it is free from complication of parts and apparently capable of being made practicably available for all the uses for which such an instrument is needed. The thermo-electric combination employed by Mr. BECQUEREL is a single couple formed of two equal wires of platinum and palladium, each being one millimeter in diameter and two meters in length, united by one extremity in a junction formed by binding them firmly together with a fine platinum wire. The two elements, which are placed parallel to each other, are in contact to the extent of about one centimeter at the junction. In order to keep them separate for the rest of their length, the palladium wire is passed through a tube of porcelain; and this tube with the two wires, is subsequently introduced into a larger tube of the same material, which last is to be exposed to the heat of the furnace. Both tubes are then filled with sand. The two wires are suitably connected at their outer extremities with the binding screws of a Weber's galvanometer, which indicates electric intensities with great exactness.

A scale of temperatures related to the intensities of the developed currents has been prepared by Mr. BECQUEREL, by comparing the indications of an air pyrometer with those of the electric pyrometer when both are similarly exposed side by side. The divisions of this scale are equivalent to ten degrees Centigrade each. It cannot yet be said, perhaps, of any form of pyrometer, unless of that of WEDGEWOOD, which, as we have seen, is untrustworthy, and which at best indicates differences of temperature very imperfectly, that its use for practical purposes is entirely unattended with inconvenience; but the electric pyrometer of Mr. BECQUEREL seems to come as near to fulfilling this condition as any that has yet been suggested.—*Barnard's Report on the Industrial Arts.*

Australia.

The yield of gold in the colony of Victoria in 1869 has been less than in any year since that of the first great rush to "the diggings." In 1868 the colony exported 1,905,942 ozs.; in 1869 the exports amounted to only 1,700,972 ozs. These returns, however, included a considerable portion of gold, the produce of other colonies. In 1868 the quantity of Victorian gold exported was 1,596,058 ozs., and in 1869, 1,340,838 ozs.; but there is not this difference in the absolute yield of the two years. Over 120,000 ozs. of gold, the produce of the year 1867, was kept back, and exported in the beginning of the year 1868, in order to save the export duty, which was finally abolished on Jan. 1 of that year. The net yield of Victoria in 1869, so far as it is possible to ascertain it, was 1,367,903 ozs., or 106,284 ozs. less than the yield of 1868.

Notwithstanding the falling off in the returns, here has been an increase in the number of miners employed from 63,181 in 1868, to 68,037 in 1869. Calculating the gold at £4 per ounce, it will be found that in 1866 the persons engaged in mining averaged 31s. per week; in 1867, 35s.; in 1868, 36s.; and in 1869 within a small fraction of 31s., or about the same as in 1866. The men engaged at the principal mines on weekly wages have received far more than this. The difference will serve to show the large amount of capital which is constantly being expended, for which, as yet, there has been no adequate return. However, if but a moderate portion of the new leads and lodes which have been lately opened turn out at all well, the present year will, in all probability, tell a very different tale. Some excellent yields were recorded in January from several of the principal gold regions, and Berlin has maintained its reputation as a nugget-producing district. Within the last fortnight of that month a dozen nuggets, averaging from five ozs. to 60 ozs., were found in this locality. A peculiarly shaped flat nugget, weighing somewhat over five ozs., very pure, and free from admixture of quartz or dirt, was found by a party while digging in some old ground at Little Bendigo on New Year's Day. This nugget formed part of 25 ozs. of gold, the result of the week's washing. A nugget weighing 10½ ozs. was also recently unearthed in Argyle gulley. A recent crushing of 300 tons of quartz from the Pleasant Creek Cross Reef Company's claim, Pleasant Creek, gave a very respectable yield of 861 ozs. 19 dwts., or an average of 2 ozs. 17 dwts. to the ton.

The Bendigo *Advertiser* says: "Our metallic resources, which, so far as gold is concerned, are daily becoming more and more perceived to be practically inexhaustible, are in the future to be increased by the addition of various metals, of which silver and zinc are not the least important. Iron ore has been met with in many localities, but hitherto not in quantity sufficient to warrant the erection of smelting works. Now, however, it is extremely probable that iron will be added to the list of our products, as a very fine band of iron ore has been struck in this neighborhood, a sample of which, in the hands of Mr. Shiress, assayer for the Bank of New South Wales, has resulted in a fine button or piece of iron that shows the ore to contain at least 80 per cent. of the metal."

South American Items.

RAILWAYS are all the vogue in Chili and Peru. The Concepcion and Chilian line progresses rapidly. A road is projected across the Andes. On the first of February last a railway from Callao to Oroya was commenced, the latter point being connected by navigable rivers with the Atlantic Ocean. Another new line is being made in Peru to run from Arequipa to Puno, and thus connect the Pacific with Lake Titicaca. The Oroya line will be 222 miles long, with 27 tunnels and 17 bridges; the cost is put down at 27½ million dollars, the Government giving 6 per cent. interest and two per cent amortization. The Arequipa line will be 137 miles long, with 12 great tunnels, and costing 32 million dollars.

Telegraphs are also in progress. The Botafoga passenger railway at Rio Janeiro carried last year 3,000,000 passengers, the population of the city being about 500,000. The Union road at Montevideo, running to an insignificant suburb, carried 400,000 passengers. There are three passenger roads in construction in Buenos Ayres and six more projected. These roads run into the country, and cost from $8,000 to $15,000 a mile.

The Province of Buenos Ayres, with an area of 70,000 square miles, has more than one-fourth of the entire population of the Argentine Republic, showing a proportion of seven inhabitants to the square mile. Owing to the great influx of Europeans this province has doubled its population since 1855, and at present three-fourths of the adult population in the city, and about one-half that of the rural districts, is composed of foreigners. The population of the city is 177,880, and of the country 317,241.

The gaucho element is fast disappearing as railways and agriculture progress on all sides; there are over 200 miles of railway open to traffic, besides the branch lines in construction. Buenos Ayres, when Congress is remodelled, will be entitled to 25 deputies, the total number being 93. This province has 60 million sheep, and could give 100 acres of land and 120 sheep to each of its inhabitants.—*Baltimore Gazette.*

Eyes.

THERE is a wonderful diversity among animals in respect to the number of their eyes. In mammals, birds, reptiles, and fishes they are limited to two, and are always placed on the head. The greater part of the surface of the house-fly is covered by an aggregation of about 10,000 eyes; and in the dragon-fly they number about 50,000, and may be easily seen by the use of a magnifying lens even of very small power. They are not always confined to the head alone. In spiders and scorpions there are generally eight or ten of them in one or more clusters, on the dorsal aspect of that part of the body which is formed by the union of the head and thorax. The star-fish or five-fingers, familiar to every one who has spent any time on our sea-coast, has an eye on the tip of each ray or arm. In the sea-urchin, which is homologically nothing but a star-fish with the ends of its rays drawn close together, the five eyes are gathered in a circle around what is considered the hinder portion of the body. The scallop has numerous eyes on the edge of his mantle, extending from one end of the animal to the other, and forming a semi-circle. Some marine worms have them in clusters, not only on the head, but also along each side of the body, even to the tip of the tail, and they are connected individually and directly with the medium nervous cord. If we descend to the lowest forms, we find many infusoria which have neither eyes nor nerves, and yet it is easy to see that they are sensitive to light, for they either seek or avoid it.—*Hours at Home.*

French Bank Notes.

THE life of a French bank note is said to average two or three years, and does not terminate until the condition is very shaky indeed—crimpled, pierced with pin-holes, corner creases torn, soft, tarnished, decrepit while yet young. Some have been half burned; one has been found half digested in the stomach of a goat, and one boiled in a waistcoat pocket by a laundress. No matter; the cashier at the bank will do his best to decipher it; he will, indeed, take an infinity of trouble to put together the ashes of a burnt note, and will give the owner a new note or the value in coin, if satisfied of the integrity of the old one. The bank authorities preserve specimens of this kind as curiosities, minute fragments gummed in their proper position on a sheet of paper. Very few of the notes are actually and irrecoverably lost. During the last sixty-seven years, 24,000 bank notes of 1,000 francs each have been issued, and of this number 23,958 have been returned by the month of January last, leaving only forty-two unaccounted for. Whether they are still in existence or burned into uncollected ashes, or at the bottom of the sea, or elsewhere, is not known. Of 500 franc notes, 24,934 have been returned out of 25,000.—*Chambers' Journal.*

Alligator's Nests.

THESE nests resemble hay-cocks, four feet high, and five in diameter at their base, being built with grass and herbage. First, they deposit one layer of eggs on a floor of mortar, and having covered this with a second stratum of mud and herbage eight inches thick, lay another set of eggs on that, and so on to the top, there being commonly from one to two hundred eggs in a nest. With their tails they then beat down around the nest the dense grass and reeds five feet high, to prevent the approach of unseen enemies. The female watches her eggs until they are all hatched by the heat of the sun, and then she takes her brood under her own care, defending them and providing for their subsistence. Dr. LUTZENBARG, of New Orleans, once packed up one of these nests, with the eggs, in a box, for the museum at St. Petersburgh, but was recommended before he closed it, to see that there was no danger of the eggs being hatched on the voyage. On opening one a young alligator walked out, and was soon followed by the rest, about a hundred of which he fed in the house, where they went up and down stairs, whining and barking like young puppies.—*Exchange.*

The Maquoketta (Iowa) Galena Caves.

The Dubuque *Times* has the following: "Some time ago we gave an extended account of the Maquoketta Caves, which may justly be regarded as the greatest natural wonders of the Northwest. We now learn that a Mr. Larcom has struck another cave on the same crevice on which the Miliner Cave is situated. East, and between the two caves, is a bar of solid rock, about one hundred feet thick. These caves extend about three miles, and are turning out mineral in paying quantities. A few days ago Mr. Larcom discovered a solid layer of the shining galena, with indications of still larger chunks ahead. We trust that both caves will continue to grow richer until they rival the famous Mollart Cave. Messrs. Fern & Co. have also struck a cave that is likely to prove very rich, and they are now raising considerable mineral. Mr. Burge is likewise finding good mineral, and Messrs. James & Jones have mined here for about two years, with marked success. They have raised one hundred and fifty thousand pounds, and are still finding more. Messrs. Lull & Moser, we understand, are working a good mine also. Mr. St. John is mining on what is called the 'East Lot,' and is bringing to the surface heavy mineral. Mr. Miller, an old miner in that part of the country, has several good prospects, some of which promise to turn out rich."

MISCELLANEOUS.

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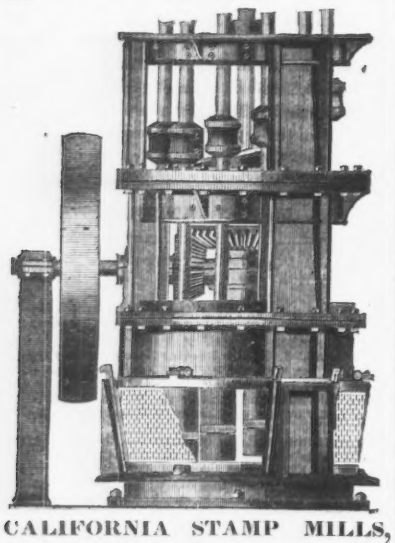

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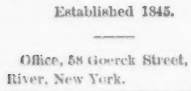

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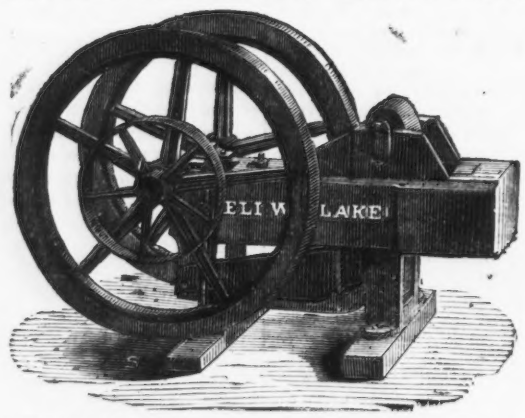

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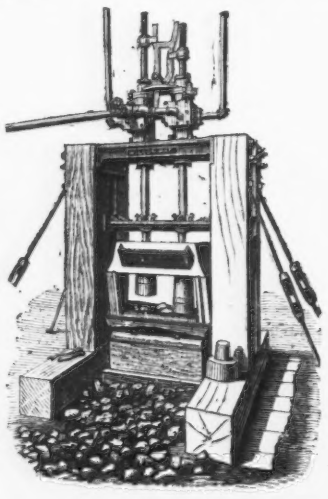

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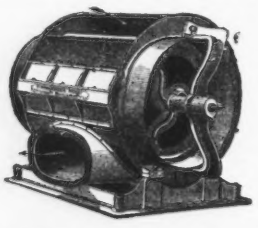

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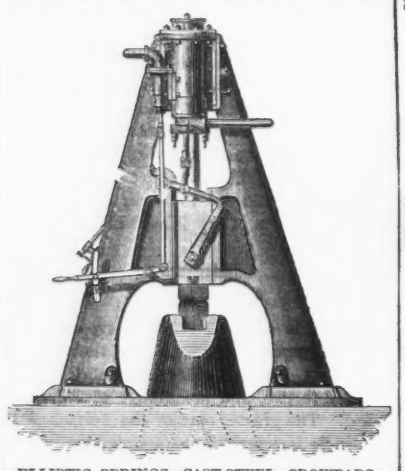

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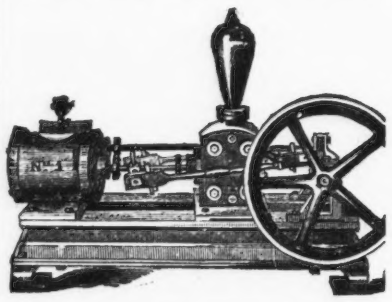

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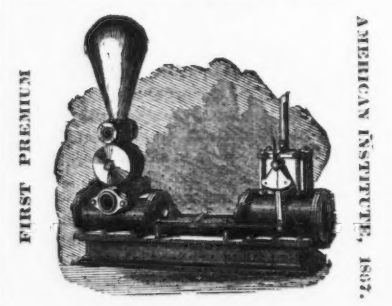

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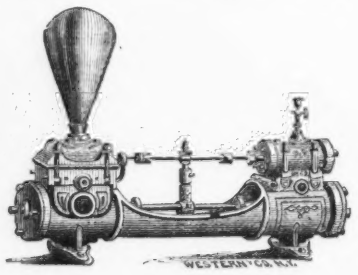

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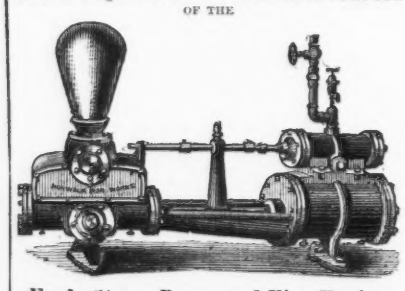

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" Dividing of, but not into "separate and and distinct" current (plans)
" Crossings (see H on plans)
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" How to find the weight of
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" Expansion of
" Its velocity and force
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" Quantity produced by natural ventilation
" Splitting, why it should be adopted
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" Working out in long wall (plans)
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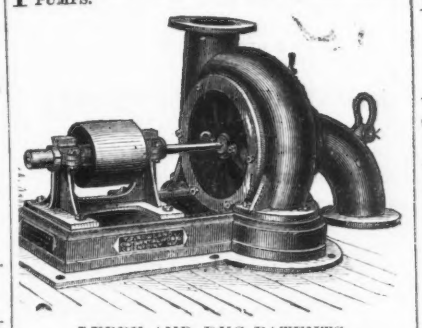

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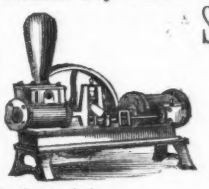

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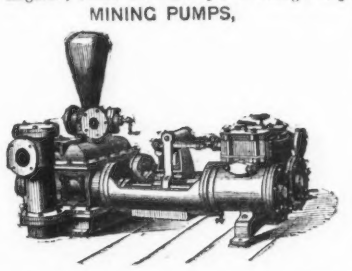

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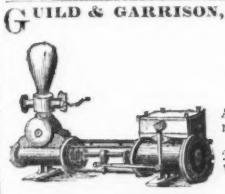

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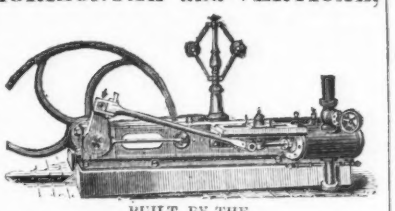

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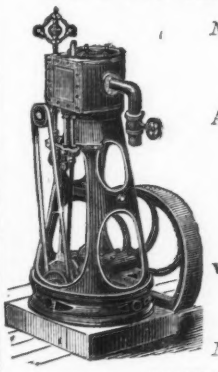

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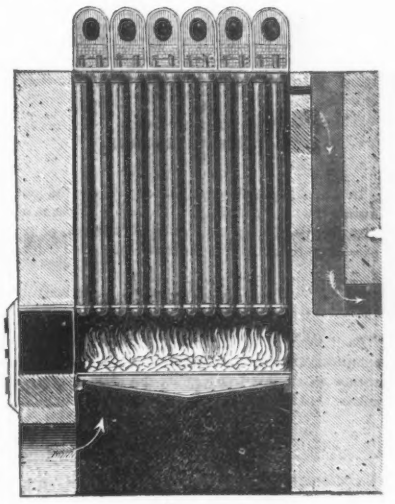

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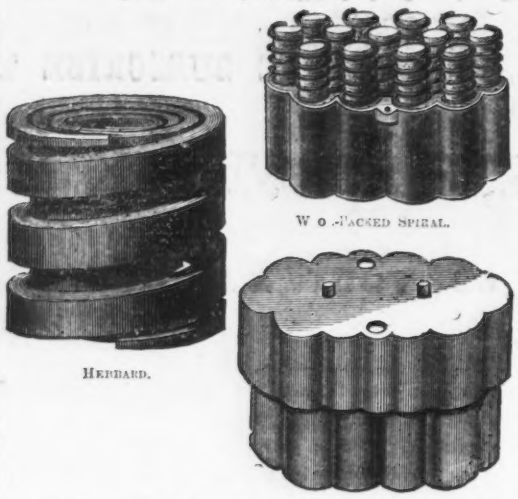

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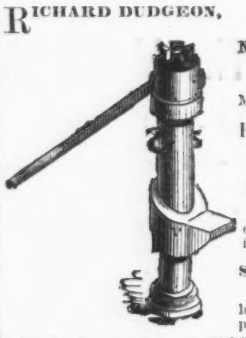

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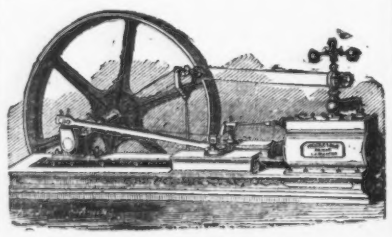

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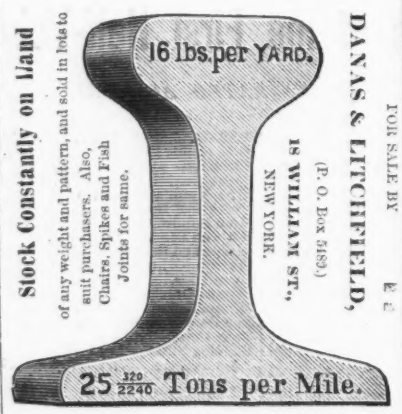
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